

IMPORTANT BIRD AND BIODIVERSITY AREAS IN INDIA

Priority sites for Conservation

Revised and updated 2nd Edition Vol. II



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**Second Edition: Revised and Updated
Volume II**

Asad R. Rahmani, M. Zafar-ul Islam and Raju M. Kasambe

Maps prepared by

Mohit Kalra and Noor I. Khan

Team Members

Noor I. Khan, Siddesh Surve, Abhijit Malekar and Nandkishor Dudhe

Significant Contribution to this edition

Anwaruddin Choudhury, Arvind Mishra, Ajai Saxena, Dhananjai Mohan, Himmat Singh Pawar, Intesar Suhail, Khursheed Ahmad, Neeraj Srivastava, P.O. Nameer, Manoj Nair, Mrutyumjaya Rao, Praveen, J., Sanjeeva Pandey, S. Subramanya, Satya Prakash

Editors

Gayatri Ugra and Maithreyi, M.R.

Layout and Design

V. Gopi Naidu

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Bombay Natural History Society,

Hornbill House, Shaheed Bhagat Singh Road, Mumbai-400001, INDIA.

Telephone: 0091-22-28429477 and 0091-22-22821811. Fax: 0091-22-22837615.

Email: info@bnhs.org; websites: www.bnhs.org and www.ibcn.in

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Designed: V. Gopi Naidu.

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ODISHA



Chilika Lake, a Ramsar Site and an IBA, is the largest brackish-water lagoon in India. It hosts more than a million birds every winter. Within Chilika Lake is Nalabani Bird Sanctuary that is well protected by the Forest Department.

Odisha (17° 47'–22° 34' N. and 81° 22'–87° 29' E) is the ninth largest state in India and is located along its east coast. It has a geographical area of 1,55,707 sq. km, which constitutes about 4.7% of the land area of the country. The north of the state is bounded by Jharkhand and West Bengal, east by the Bay of Bengal, southeast by Andhra Pradesh and the west by Chhattisgarh.

The state can be divided into four distinct physiographic regions namely Northern Plateau, Eastern Ghats, Central Tableland and Coastal Plains. The prominent rivers flowing through the State are the Mahanadi, Brahmani, Baitarani, Subarnarekha, Budhabalanga and Rushikulya. With a length of 853 km, the Mahanadi is one of the largest rivers of the Indian subcontinent. The State is divided into 30 administrative districts.

Biogeographically, the State falls into three zones viz. Deccan Peninsula (Chotanagpur and Eastern Highlands), Lower Gangetic Plain (7B) and East Coast (8B) (Rodgers *et al.*, 2000). Meher-Homji (2001) has recognised three phytogeographic regions in the State, i.e., Deccan Plateau, Eastern Ghats and Coastal Plains.

The total length of the coastline in Odisha is about 485 km. The rivers of Odisha form deltas on the coast, such as

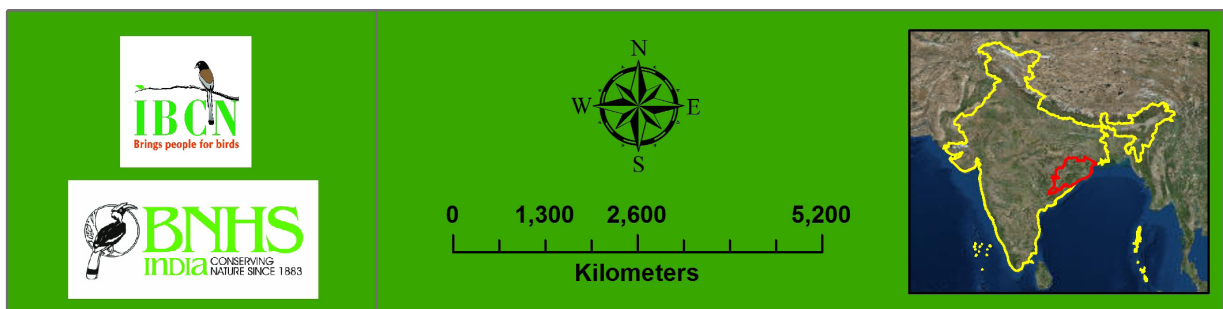
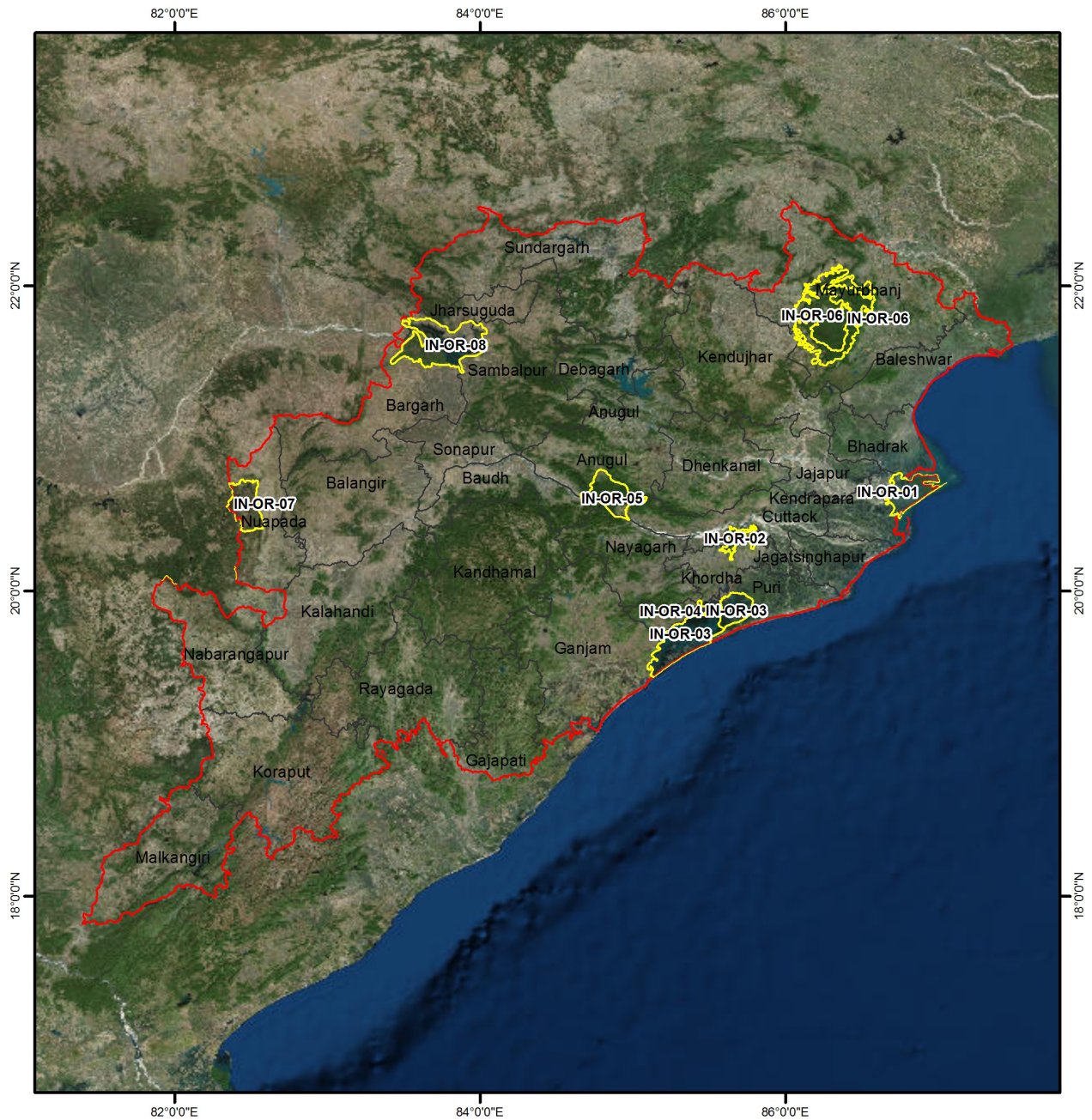
Bhitarkanika formed by the Brahmani and Baitarani rivers (Anon. 1992). Brackish water lagoons are also seen among which 1,165 sq. km Chilika Lake is the largest lagoon of India. Chilika Lake is a Ramsar site and a globally important waterfowl congregation area. The pear-shaped lagoon is about 64.5 km long and its width varies from 5 km to 20 km. It is connected to the sea by a 35-km-long narrow outer channel. In Chilika, there are several islands located in and around the lagoon covering an area of 223 sq. km. The major islands are Kalijai, Barakuda, Ghantasila, Chadhelihaga and Nalabana (Patnaik 2000).

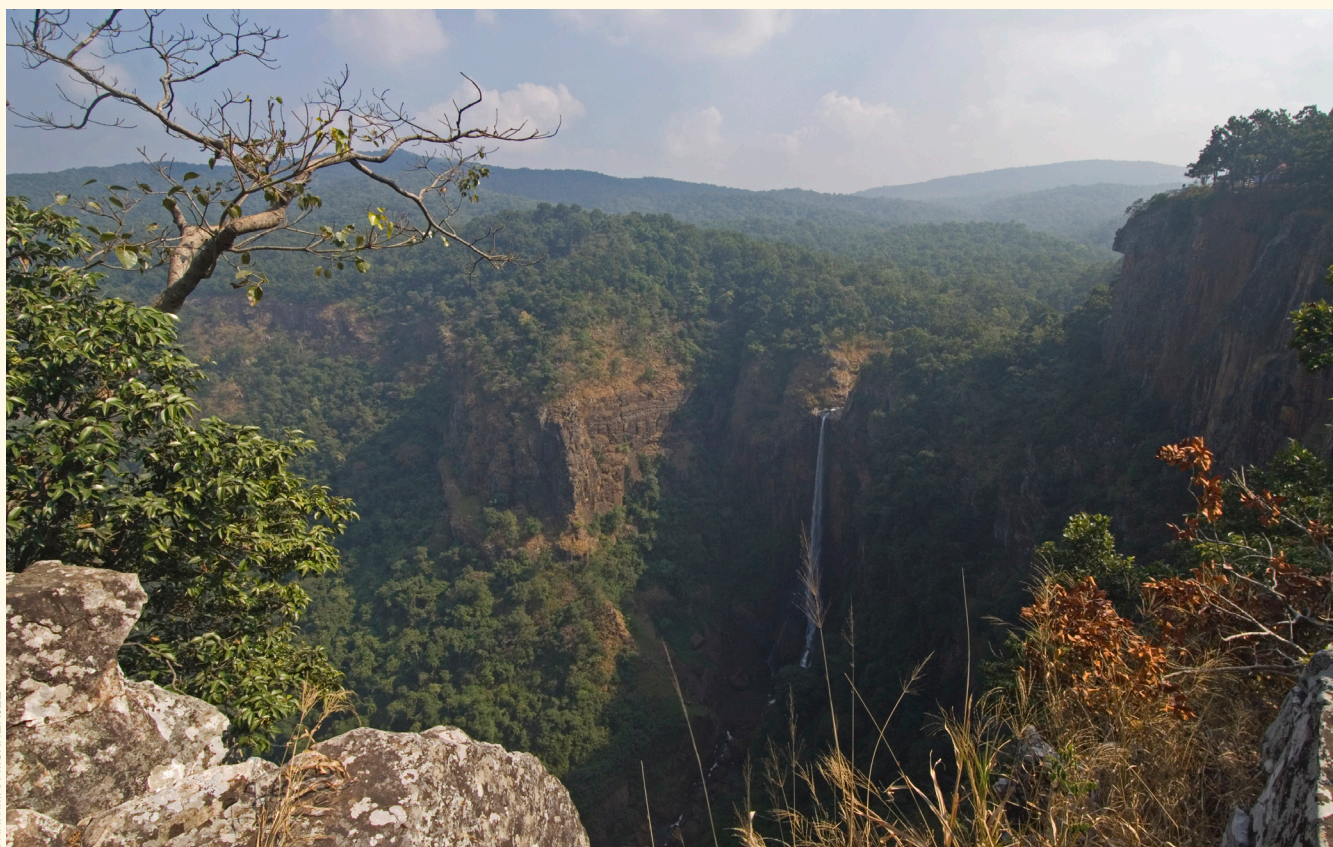
The climate is generally hot and humid. The temperature ranges from 20 °C to 41 °C, with the western districts experiencing higher mean annual temperatures. Precipitation is mainly during the Southwest monsoon (June to September) and to a lesser degree during the Northeast monsoon (September–December). The mean annual rainfall of the State ranges from 1,200 mm to 1,600 mm. The coastal area is highly prone to periodical cyclones.

Odisha is an agricultural state with over 76% of its people dependent on farming for their livelihood. The major crops are rice, pulses, oil-seeds, jute, sugarcane, coconut

Important Bird Areas in Odisha

IN-OD





Simlipal is one of the largest Tiger Reserves of India, with its sprawling 845 sq. km. of well-protected Tropical Semi-evergreen, Tropical Moist Deciduous, and Tropical Dry Deciduous forests. More than 250 bird species have been identified till now but more are likely to occur here

and turmeric. The total population is 36.7 crores of which 86% is rural. The tribal population is 22%. The population density is 297 persons per sq. km (Ministry of Environment and Forests 1999; Forest Survey of India 2001).

Vegetation and Forest Types

As per Champion and Seth (1968) and Panigrahi (1983), the vegetation of Odisha comes under five types: (i) Odisha semi-evergreen forests (ii) Tropical moist deciduous forests (iii) Tropical dry deciduous forests (iv) Central Indian hill forests and (v) Littoral and tidal swamp forests. However, considering the physical features and agro-climatic conditions, the State can be divided into four distinct regions as follows:

a. The Northern Plateau

This region is a continuation of the Chotanagpur plateau and includes the districts of Mayurbhanj, Keonjhar, Sundargarh, and portions of Angul, Jajpur, Deogarh and Sambalpur districts. The main rivers are the Brahmani, Baitarni, Salandi and Budhabalanga. They constitute 23% of the total area of the State. The predominant forest type is Sal dominated moist deciduous, though dense semi-evergreen patches also occur in parts of Similipal in Mayurbhanj. The average altitude is about 600 m going upto 1000 m in the peaks of Meghasani and Khairiburu in Similipal.

b. The Central Region

This consists of the districts of Bolangir, parts of Dhenkanal, Boudh and Cuttack, Bargarh and parts of Sambalpur districts. The main rivers are the Mahanadi and tributaries such as the Ib, Jira, Ong and Tel. The main forest types are moist and dry deciduous. The average elevation is about 300 m except at Gandhamardan hills which is 810 m.

c. The Eastern Ghats

Covering the districts of Malkangiri, Rayagada, Koraput, Kalahandi, Phulbani and parts of Ganjam, Khurda, Nayagarh and Gajapati districts, this is the largest region and includes about 36% of the total area. The area is mainly hilly with about 300–450 m elevation, rising up to the high hills of the Eastern Ghats above 1000 m such as Deomali, Mahendragiri and Singaraj. The forest type is predominantly moist deciduous with patches of semi-evergreen as also grasslands. Main rivers are the Mahanadi, Bansadhara and Nagabali. Many interesting species have been recorded from this region (Majumdar, 1988).

d. The Coastal Plains

This region covers the districts of Cuttack, Puri, Balasore and parts of Ganjam. Most of the area is taken up by rice paddy and human habitations though unique

IBAs of ODISHA		
IBA site codes	IBA site names	IBA criteria
IN-OR-01	Bhitarkanika Wildlife Sanctuary	A1, A4ii
IN-OR-02	Chandka–Dampara Wildlife Sanctuary	A1, A3, A4ii
IN-OR-03	Chilika Lake and Wildlife Sanctuary	A1, A4i, A4iii
IN-OR-04	Mangala Jodi	A1, A4i, A4iii
IN-OR-05	Satkosia Gorge Wildlife Sanctuary	A1, A3
IN-OR-06	Simlipal National Park	A1, A3
IN-OR-07	Sunabeda Wildlife Sanctuary	A1, A3
IN-OR-08	Hirakud Reservoir	A1, A4iii



MANOJ NAIR



MANOJ NAIR-A.K. PRADHAN



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Simlipal is one of the largest Tiger Reserves of India, with its sprawling 845 sq. km. of well-protected Tropical Semi-evergreen, Tropical Moist Deciduous, and Tropical Dry Deciduous forests. More than 250 bird species have been identified till now but more are likely to occur here

DHRITIMAN MUKHERJEE



MANOJ NAIR



Satkosia Gorge Sanctuary, now a Tiger Reserve since 2007, was recognized an IBA in 2004 for its varied birdlife, including regular presence of significant numbers of of Vulnerable Indian Skimmer *Rynchops albicollis* and many other species. Hirakud Reservoir is now identified as a new IBA of the state due to the presence of humungous flocks of waterfowl reaching up to 80,000 in some year

habitat elements like mangrove forests, salt marshes and sand dunes also can be seen. The important rivers are the Mahanadi and its tributaries, the Brahmani, Baitarni, Devi, Rushikulya and Budhabalanga. Important wetlands for waterfowl such as the Chilika Lake and Bhitarkanika are situated here.

Odisha harbours an estimated number of 3100 species of vascular plants (angiosperms and pteridophytes (Ved *et al.* 2008). Among the lower group of plants, 45 species of bryophytes and 35 species of lichens have so far been reported from the State (Dash 2012, Upreti 1993). Similarly, 102 species of mushrooms have been reported from Odisha

(Gupta *et al.* 2012). The State is credited with 125 orchid species, about 12% of the total diversity of the country. Of the 125 species of Indian mangrove flora (39 mangroves and 86 mangrove associates), Odisha ranks the highest among all states with a total of 101 species (Kathiresan, 2010)

Protected Area Network

Of the total geographical area of 1,55,707 sq. km, the total recorded forest area is 58,136 sq. km (Forests Survey of India 2013). Of the State's total geographical area, 35 per cent is covered with forests. This works out to be about 7 per cent of India's total forest area. The protected areas

(PA) constitute 10.37% of the total forest area. There are 19 wildlife sanctuaries and two national parks in the State, constituting 5.36 % of the total area of the state under PA network.

Similipal is the only Biosphere Reserve of Odisha. Similipal was declared a Biosphere Reserve by the Government of India due to its vast biodiversity and rich natural heritage (Mohanty *et al.* 2002).

Flora and Fauna

Odisha's unique location in peninsular India has blessed it with an interesting and rich assemblage of floral and faunal diversity. The fauna of the State is diverse and has been documented by several workers. Eighty-six species of mammals, 524 species of birds, 131 species of reptiles,

a population of Oriental Small-clawed Otter *Aonyx cinerea* and Stripe-necked Mongoose *Herpestes vitticollis* from the State (Manoj V. Nair, *per. comm.* 2015), the former species thought to be discontinuously distributed in north-east India and Western Ghats, and the latter confined to the Western Ghats.

Among reptiles, Odisha is the only state with all three Indian crocodilians, and the largest population of Saltwater Crocodile *Crocodilus porosus* and Water Monitor lizard. Further, the Odisha coast is known for the world's largest rookery of Olive Ridley Sea Turtle *Lepidochelys olivacea*. There are three mass nesting beaches of the Olive Ridleys: Gahirmatha coast, Devi and Rushikulya river mouth (Kar 2000). There are eight species of sea turtles in the world, of which four are known to occur in the coastal areas of Odisha:



Pale-capped Pigeon *Columba punicea* (left) and Mangrove Pitta *Pitta megarhyncha* (right) have been found in good numbers in Odisha in recent years

27 species of amphibians and more than 600 species of fishes (marine and fresh water) have been recorded from the State. The invertebrate faunal composition has been poorly documented. However, the State is home to over 250 species of butterflies, 102 species of odonates, 48 species of marine molluscs, 12 species of blattaria (Arthropoda: insecta), 14 species of dermaptera (Arthropoda: insecta), 31 species of isoptera, 32 species of land molluscs, 48 species of nematodes and 46 species of oligochaeta (ZSI 1993; Acharjyo 1998; Dutta 1990; Dutta 1997; Dutta and Acharjyo 1997; Dutta and Ahmed 1989; Dutta and Mohanty-Hejmadi 1993; Murthy 1987).

The mammalian fauna is diverse, with almost all the large and smaller mammals of central India are found in the State, including Leopard *Panthera pardus*, Tiger *Panthera tigris*, Wild Dog *Cuon alpinus*, Honey Badger *Mellivora capensis*, Fishing Cat *Felis viverrina*, Indian Fox *Vulpes bengalensis*, Four-horned Antelope *Tetracerus quadricornis*, Sambar *Rusa unicolor*, Chital *Axis axis* and Gaur *Bos gaurus*. Worthy of mention is the globally unique melanistic Tiger population of Similipal and the recent discoveries of

Olive Ridley *Lepidochelys olivacea*, Hawksbill *Eretmochelys imbricate* Leatherback *Desmochelys coriacea* and Green Sea Turtle *Chelonia mydas*. Although four species are found in the State, the confirmed nesting of only one species, the Olive Ridley, is known so far (Dash and Kar 1990).

IBAS IN ODISHA

In 2004, Islam and Rahmani (2004) had identified seven IBAs. One more has been added in this book but more are likely to be present. We do not have enough data to identify sites that would qualify the international IBA criteria developed by BirdLife International (unpublished). The same criteria are followed all over the world for identification of IBAs.

AVIFAUNA

The bird life in Odisha is very rich, with 524 species reported till now (Inskipp 2014), including historical records, primarily those by Valentine Ball (Ball, 1876, 1877, 1878). Because of its biogeographical location, the avifauna has a curious mixture of various elements. The Similipal hills

appears to have biogeographical affinities to the Northeast and therefore has populations of some birds that are known only in the Himalayas and southern Assam hills such as Collared Falconet *Microhierax caerulescens*, Pale-capped Pigeon *Columba punicea*, Abbot's Babbler *Malacocinla abbotti*, Grey Treepie *Dendrocitta formosae* and Pale-footed Bush Warbler *Cettia pallidipes*. The State also possibly forms the southernmost limit of several Himalayan/Northeastern species such as Lineated Barbet *Megalaima lineata*, Thick-billed Pigeon *Treron curvirostra*, Grey-headed Woodpecker *Picus canus*, Large Yellownape *Picus flavinucha* and Fulvous-breasted Woodpecker *Dendrocopos macei*. Further, recent observations have indicated that almost all bird species classically thought to be discontinuously distributed such as the Little Spiderhunter *Arachnothera longirostra*, Dollarbird *Eurystomus orientalis*, Great-eared Nightjar *Lyncornis macrotis*, Rufous-bellied Eagle *Lophotriorchis kienerii*, Black Baza *Aviceda leuphotes*, Jerdon's Baza *Aviceda jerdoni* (Ripley *et al.* 1985) are the best avian examples showing discontinuous distribution.

Among the Critically Endangered species, the White-rumped Vulture *Gyps bengalensis* and Long-billed Vulture *G. indicus* are present in the State. Birds such as the Great Indian Bustard *Ardeotis nigricipes* and Lesser Florican *Sypheotides indica* were found earlier but there is no recent record (Rahmani and Manakadan 1990). The Greater Spotted Eagle *Clanga clanga*, Pallas's Fish-Eagle

Haliaeetus leucoryphus, Wood Snipe *Gallinago nemoricola*, Bristled Grass- Grassbird *Chaetornis striatus*, Green Munia *Amandava formosa*, Great Knot *Calidris tenuirostris* are some of the threatened species found in some IBAs. In Odisha, we find 12 out of 54 Vulnerable species listed for India by IUCN (2014). Six of the 73 Near Threatened bird species occur in Odisha. For 19 species, the IBAs and protected areas of Odisha are highly important for survival.

THREATENED BIRDS FOR WHICH ODISHA MAY BE IMPORTANT

White-rumped Vulture *Gyps bengalensis* Critically Endangered

Twenty-five years ago, White-rumped vulture was very widely distributed in the State, but now it has become uncommon. Till the late 1980s and early 1990s, it was common, especially in the coastal districts of Balasore, Bhadrak, Puri and Ganjam. Specific records are from Similipal Tiger Reserve, Anandapur, Athmallik, Chandaka Sanctuary, Chilika lake environs, Barbara Reserve Forest, Puri, and Bhitarkanika National Park, the latter being a breeding stronghold of this vulture. Based on his studies in the early 1990s, Pandav (1997) found it as common in Bhitarkanika and mentioned it breeding during December and January. During 2005-2006, Gopi & Pandav (2007) reported the status to be rare and that about 10 individuals were present in Rangadapatia and Barapita forest areas



ASHISH KOTHARI

There are many community conserved areas such as Brahmanikumi forest (above).
Manglajodi (an IBA), Rupabalia, Suruguda, and Jarmal

LIST OF EXTANT THREATENED BIRDS OF ODISHA WITH IBA SITE CODES

CRITICALLY ENDANGERED		
Baer's Pochard	<i>Aythya baeri</i>	IN-OR-01, 03
White-rumped Vulture	<i>Gyps bengalensis</i>	IN-OR-01, 02, 05, 06, 07
Long-billed Vulture	<i>Gyps indicus</i>	IN-OR-01, 02, 05, 06, 07
Red-headed Vulture	<i>Aegypius calvus</i>	IN-OR-06
Spoon-billed Sandpiper	<i>Eurynorhynchus pygmeus</i>	IN-OR-03 (old record)
ENDANGERED		
Egyptian Vulture	<i>Neophron percnopterus</i>	No record from IBAs
Spotted Greenshank	<i>Tringa guttifer</i>	IN-OR-01, 03
Black-bellied Tern	<i>Sterna acuticauda</i>	IN-OR-01, 03, 08
VULNERABLE		
Dalmatian Pelican	<i>Pelecanus crispus</i>	IN-OR-03
Lesser White-fronted Goose	<i>Anser erythropus</i>	IN-OR-03, 04
Lesser Adjutant	<i>Leptoptilos javanicus</i>	IN-OR-01, 03
Asian Woollyneck	<i>Ciconia episcopus</i>	IN-OR-03
Pallas's Fish-Eagle	<i>Haliaeetus leucoryphus</i>	IN-OR-03, 08
Greater Spotted Eagle	<i>Clanga clanga</i>	IN-OR-01, 03, 04, 06, 08
Indian Spotted Eagle	<i>Clanga hastata</i>	IN-OR-01, 04, 08
Great Knot	<i>Calidris tenuirostris</i>	IN-OR-01, 03
Indian Skimmer	<i>Rynchops albicollis</i>	IN-OR-01, 03, 05, 08
Pale-capped Woodpigeon	<i>Columba punicea</i>	IN-OR-01, 02, 05, 06
Bristled Grassbird	<i>Chaetornis striatus</i>	IN-OR-05
Green Munia	<i>Amandava formosa</i>	IN-OR-06
NEAR THREATENED		
Ferruginous Duck	<i>Aythya nyroca</i>	IN-OR-03, 04, 08
Falcated Duck	<i>Mareca falcata</i>	IN-OR-03, 08
Spot-billed Pelican	<i>Pelecanus philippensis</i>	IN-OR-01, 03, 04, 08
Oriental Darter	<i>Anhinga melanogaster</i>	IN-OR-01, 02, 03, 04, 08
Painted Stork	<i>Mycteria leucocephala</i>	IN-OR-01, 03, 04, 08
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	IN-OR-01, 03
Black-headed Ibis	<i>Threskiornis melanocephalus</i>	IN-OR-01, 03, 04, 08
Great Thick-knee	<i>Esacus recurvirostris</i>	IN-OR-01, 03, 05
River Lapwing	<i>Vanellus duvaucelli</i>	IN-OR-01, 02, 03, 05, 07, 08
Eurasian Curlew	<i>Numenius arquata</i>	IN-OR-01, 03, 04, 05, 08
Black-tailed Godwit	<i>Limosa limosa</i>	IN-OR-01, 03, 04, 08
Asian Dowitcher	<i>Limnodromus semipalmatus</i>	IN-OR-03
River Tern	<i>Sterna aurantia</i>	IN-OR-03, 04, 05, 08
Cinereous Vulture	<i>Aegypius monachus</i>	Not reported from any IBA
Pallid Harrier	<i>Circus macrourus</i>	IN-OR-01, 03, 04
Grey-headed Fish-eagle	<i>Ichthyophaga ichthyaetus</i>	IN-OR-06
Red-headed Falcon	<i>Falco chicquera</i>	IN-OR-06, 07
Laggar Falcon	<i>Falco jugger</i>	IN-OR-03
Brown-winged Kingfisher	<i>Pelargopsis amauroptera</i>	IN-OR-01
Malabar Pied Hornbill	<i>Anthraceros coronatus</i>	IN-OR-05, 06
Alexandrine Parakeet	<i>Psittacula eupatria</i>	Mainly outside IBAs
Mangrove Pitta,	<i>Pitta megarhyncha</i>	IN-OR-01

of Bhitarkanika. Two nests with two juveniles were also sighted on *Sonneratia apetala* trees in March 2005. However, the population seems to have largely vanished from Bhitarkanika of late, indicative of the precipitous decline throughout the State and the country.

Long-billed Vulture *Gyps indicus*

Critically Endangered

Its fate is not very different from the earlier species. From being very common, 25 years ago, its population has seen precipitous decline all over the State. The two main

areas of congregation were Badgaon in Sundergarh and Bamra in Sambalpur. They were also recorded from the outskirts of Similipal. Based on the studies in 1990s, Pandav (1997) mentions the status of this species as common in Bhitarkanika, while Gopi and Pandav (2007) did not record it there during their study from August 2004 to October 2006.

Spoon-billed Sandpiper *Eurynorhynchus pygmeus*
Critically Endangered

During studies conducted by the Bombay Natural History Society at Chilika, one individual was ringed in 1981 (Ali 1981). This is the last authentic record of its occurrence in the Lake. It was neither sighted nor ringed during BNHS studies from 2001 to 2009 (Balachandran *et al.* 2009). Although there is no recent record of this bird in Chilika Lake, there are chances that a few individuals may winter in the mud flat and shoreline of this vast Lake.

Indian Skimmer *Rynchops albigollis*
Vulnerable

Historically, this species have been seen in “a large flock consisting of skimmers and terns”, on the Mahanadi River (Ball 1876, 1878) and thought to be resident (D’Abreu 1935). Tikarpara in Satkosia Gorge Wildlife Sanctuary and Barunei River Mouth in Bhitarkanika WLS are regular wintering sites for this species. Intensive surveys along the undisturbed sandbanks of the Mahanadi during summer might result in discovering small breeding populations.

This species has been recorded from Bhitarkanika Wildlife Sanctuary (Gopi and Pandav 2007), Dhamra area (Dutta 2007), Nalabana Bird Sanctuary and outer channel area of Chilika Lake (Balachandran *et al.* 2009), Hirakud reservoir (Nair *et al.* 2014), Satkosia Gorge Wildlife Sanctuary and banks of the Mahanadi at Mundali (Dev 2013). Bhitarkanika, mainly the Praharajpur and Barunei estuary is a key congregation area and winter habitat for this species, with about 100 birds congregating there. Similarly, the shingle islands along the Mahanadi River bed in the gorge at Tikarpara inside Satkosia Sanctuary is also a stronghold.

Purple-wood or Pale-capped Pigeon
Columba punicea
Vulnerable

In the past, this north-eastern bird was reportedly seen in the Similipal hills of Mayurbhanj at an elevation of about 600–900 m (Jayakar 1967), and also in the Chandaka Dampara Sanctuary and near Bhubaneswar (Jayakar 1967). However, recent studies have confirmed a very good population in Similipal Tiger Reserve. It is also reported from the coastal Bhitarkanika (Gopi and Pandav 2007) There are

several recent reports from Ekamra Kanan (bamboo scrub adjoining Chandaka Wildlife Sanctuary), Barbara Reserve Forest, Nandankanan Sanctuary and Hindol Reserve Forest near Dhenkanal (Manoj V. Nair, *pers. comm.* 2015).

Green Avadavat *Amandava formosa*
Vulnerable

In Odisha, this species has been reported mostly from Jeypore (Whistler and Kinnear 1933) and Koraput (Majumdar 1988) in Koraput district. At present, the most promising site seems to be Karlapat Sanctuary, Kalahandi district where these birds were common in the Eastern part of the Sanctuary (Palei *et al.* 2011; Palei 2012). Other recent records are from Sohela, Bargarh district (Manoj V. Nair, *pers. comm.* 2015) and from outskirts of Bolangir town (January 2013, Partha Pratim Patra, *pers comm.* 2015) and 20 birds from Kotagarh Wildlife Sanctuary (S.K. Sajan and P. Mahapatra *pers. comm.* 2015).

River Tern *Sterna aurantia*
Near Threatened

River tern *Sterna aurantia* has been uplisted to Near Threatened category because increasing human disturbance and dam construction projects are expected to cause a moderately rapid population decline over the next three generations (Birdlife International 2014). Sathiyaselvam and Balacandran (2007) reported a large breeding colony of River Tern from Nalabana island on Chilika Lake. Number of nests observed by them were 540 (2002), 476 (2003) and 304 (2004).

Mangrove Pitta *Pitta megarhyncha*
Near Threatened

This very rare habitat specialist species is found only in the dense mangrove patches of Bhitarkanika. Though Pandav (1997) did not report it there, Gopi & Pandav (2007) considered it to be fairly common. However, breeding was recorded only in 2014 (Nair *et. al.* in press) where four nests were found in Dangmal area of Bhitarkanika Forest Block. A subsequent survey during 2014 and 2015 using call playback located some 60 pairs in various forest blocks of the National Park area. It is also reported from the mangroves near Dhamra.

Brown-winged Kingfisher *Pelargopsis amauroptera*
Near Threatened

This mangrove specialist kingfisher has a good breeding population in Bhitarkanika National Park and the park is possibly one of its global strongholds.

THREATS AND CONSERVATION ISSUES

Like other states, Odisha also faces the problem of rapid increase in human population, expansion of agriculture,

industrialization, road expansion cutting through some prime forests, and mining. Mining is a huge issue and unfortunately, most mine-rich areas are left in forests and biodiversity rich areas.

Inland wetlands are being reclaimed for industrial development and real estate business. In larger urban and semi-urban wetlands and rivers, uncontrolled boating activities for tourists have been seen to cause major disturbance to both resident birds and migratory waterfowl.

The coastal ecosystem of the State and its diverse habitats are threatened by problems of erosion, siltation, pollution, flooding, salt water intrusion, cyclones, storm surges, artificial lighting, over-fishing, changing land and sea use and overall increase in human settlements (Kar 2000). Mushrooming of prawn *gherries* and aquaculture ponds in coastal habitats is another socio-political issue.

Nature-based tourism is being aggressively promoted in Odisha. If unregulated, even this so-called tourism can have deleterious impacts on precious breeding bird habitats. Hence it is imperative that virgin forest and wetland areas are opened for visitors after careful consideration and thought.

Though on a rapid path to prosperity, Odisha still continues to have about 32% of its population below the poverty line (http://www.odisha.gov.in/pc/download/economic_survey_2014-15.pdf). Most of these people belong to the tribal communities living in forested landscapes and necessarily have to depend on forests for their livelihood, thus exerting a continuous biotic pressure on the forests for fuel wood, timber and minor forest produce. At the same time, very good community-based conservation initiatives have taken place where the local people protect their natural resources.

Poaching of birds, especially waterfowl, for selling to roadside eateries has of course reduced over time in intensively protected areas such as Chilika and Mangalajodi, but still continues to persist in some interior pockets. However, pervasive small scale trapping of birds for own consumption by certain tribal communities still takes its toll, especially on some birds such as quails, francolins, Red Junglefowl *Gallus gallus murghi*, spurfowls and even hornbills. Trapping and killing of birds by marginal farmers to prevent crop loss, though not a major threat has also been noticed in some areas.

Illegal trapping for pet bird trade is also a significant threat, with the most affected species being three species of parakeets, Hill Myna *Gracula religiosa* and four species of munias with bulbuls and mynas also being marginally affected. Trapping of large species of owls such as Brown Fish Owl *Ketupa zeylonensis* and Indian Eagle Owl *Bubo bengalensis* and their sale at unbelievably high prices, ostensibly for black magic rituals has also been on the rise.

Apart from the above mentioned threats which are

anthropogenic, there are natural factors too, which impact birds and their habitats. Situated in the cyclone-prone east coast of India with a coastline of over (485 km), Odisha has always been vulnerable to natural disasters such as tropical cyclones, hurricanes and recurrent floods. The supercyclone which occurred in 1999 was exceptionally severe and caused widespread damage in the coastal districts, literally destroying important components of the bird habitat such as tall mature trees used for nesting and roosting and fruit trees which were an important food source. The State was again subjected to a very severe cyclonic storm 'Phailin' on the 12 September 2013 where wind speeds of over 200 km/hr were reported, again causing widespread damage to bird habitats, especially in the coastal districts of Ganjam and Puri. Massive tree falls were also reported from several protected areas, some located inland too, such as Similipal Tiger Reserve and Satkosia Gorge Tiger Reserve.

Proliferation of alien invasive species could also be an important factor responsible for reduction of habitat quality and therefore the number of birds. The insidious spread of Water Hyacinth in various waterbodies, taking over of natural vegetation by unpalatable weeds such as *Parthenium*, *Eupatorium* and *Mikania* are glaring examples of this.

REFERENCES

- Acharjyo, L. N. (1998) Role of Zoos in the conservation of reptiles in India. *Cobra*. 33: 15–22.
- Acharya, S. and Kar, S.K. (1996) Checklist of waders (Charadriiformes) in Chilika Lake, Odisha. *Newsletter for Birdwatchers* 36: 89–90.
- Ali, S. (1981) Studies on the movement and population structure of Indian Avifauna. Annual Report. Bombay Natural History Society, Mumbai.
- Anonymous (1992) Coastal Environment. Remote Sensing Application Mission, SAM/SAC/COM/SN/11/92. Indian Space Research Organisation. Ahmedabad. Pp. 1–114.
- Balachandran, S., Sathiyaselvam, P. and Panda, S. (2009) *Bird Atlas of Chilika*. Bombay Natural History Society, Mumbai and Chilika Development Authority, Bhubaneswar.
- Ball, V. (1876) Notes on some birds collected in Sambalpur in Odisha. *Stray Feathers* 4: 231–237.
- Ball, V. (1877) Notes on birds observed in the region between the Mahanadi and Godavari rivers. *Stray Feathers* 5: 410–420.
- Ball, V. (1878) From the Ganges to the Godavari. On the distribution of birds, so far as it is present known, throughout the hilly region, which extends from the Rajmehar Hills to the Godavari valley. *Stray Feathers* 7: 191–235.
- BirdLife International (2001) *Threatened Birds of Asia: the BirdLife International Red Data Book*. 2 Vols. BirdLife International, Cambridge, UK.
- BirdLife International (2014) IUCN Red List for birds. Downloaded from <http://www.birdlife.org>
- Champion, H.G. and Seth, S.K. (1968) *A Revised Classification of Forest Types of India*. Manager of Publication, New Delhi.
- D'Abreu, E.A. (1935) A list of the birds of the Central Provinces. *J*

- BNHS. 38: 95–116.
- Dash, M.C. and Kar, C.S. (1990) *Turtle Paradise Gahirmatha* (An Ecological Analysis and Conservation Strategy) M/S. Interprint Publishers, New Delhi. Pp. 300.
- Dash, P.K. (2012) Biodiversity of aquatic plants of Similipal Biosphere Reserve, Odisha. PhD. thesis. Utkal University, Utkal.
- Dev, U. N. (2013) *A Field Guide to the birds of Chilika*. Odisha Forestry Sector Development Project, Bhubaneswar, pp. 281.
- Dutta, S.K. (1990) Ecological natural history and conservation of herpetofauna of Orissia, India. *Tiger Paper* 17: 20–28.
- Dutta, S.K. (1997) Herpetofaunal assessment of northeastern Odisha with special reference to Similipal. In: *Similipal: A natural habitat of unique biodiversity*. (In: Tripathy, P.C. and Patro, S.N. Eds). Odisha Environmental Society, Bhubaneswar. Pp. 92–104.
- Dutta, S.K. and Acharjyo, L.N. (1997) Further additions to the herpetofauna of Odisha, India. *Cobra*. 30: 1–8.
- Dutta, S.K. and Ahmed, (1989) Report on a herpetological collection trip to Barbara, Puri district, Odisha. *Hamadryad* 14 (2): 36–37.
- Dutta, S.K. and Mohanty–Hejmadi, (1993) Herpetofauna of Odisha and their conservation. *Bihang Newsletter* 1(3): 7–8.
- Dutta, S. K. (2007) *Biodiversity assessment of Dhamra port site and surrounding areas, Orissa*. Bangalore: Greenpeace India. <http://www.greenpeace.org/raw/content/india/press/reports/greenpeace-biodiversity.pdf>
- Forest Survey of India (2001) State of Forest Report 2001. Ministry of Environment and Forest, Dehra Dun.
- Forest Survey of India (2013) State of Forest Report 2013. Ministry of Environment and Forest, Dehra Dun.
- Gupta et al. (2012)
- Hussain, S.A. (1991) Bird migration project. Annual report 1990–91. Bombay Natural History Society, Bombay. Pp. 1–101.
- Hussain, S.A., Mohapatra, K.K. and Ali, S. (1984) *Avifaunal profile of Chilka Lake: A case for conservation*. Technical Report 4, Bombay Natural History Society, Bombay.
- Inskipp, T. (2014) Checklist and bibliography of birds of Odisha, Birds of Odisha Facebook Group
- Islam, Z.A. and Rahmani, A.R. (2004) *Important Bird Areas in India: Priority Sites for Conservation*. Indian Bird Conservation Network, Bombay Natural History Society and BirdLife International (UK). Pp xviii + 1133.
- Jayakar, S.D. (1967) The Purple Wood-Pigeon (*Columba punicea*, Blyth) and the Himalayan Tree Pie *Dendrocitta formosae* Swinhoe) in Odisha. *JBNHS* 64: 109.
- Kar, C.S. (2000) Sea-turtles and their habitats in Odisha, India. In: *UNTAMED ODISHA*, Wild Odisha Publ., Pp. 105–122.
- Kathiresan, K. (2010) Importance of mangrove forests of India, *J. Coast. Env.* Vol. 1, No. 1,
- Majumdar, N. (1988) On a collection of birds from Koraput district, Odisha, India. *Rec. Zool. Surv. India, Misc. Publ. Occas. Pap.* 108. 53 pp.
- Meher-Homji, V.M., 2001. Bioclimatology and Plant Geography of Peninsular India. Scientific Publishers, Jodhpur, India.
- Ministry of Environment and Forests (1999) Forest Survey of India Report –1999. Government of India, New Delhi.
- Mohanty, R.C., Mishra, R.K. and Bal, S. (2002) Phytosociological and Plant Diversity studies of Similipal Biosphere Reserve. In: *Proceedings of the National Seminar on Conservation of Eastern Ghats*, March 24–26, 2002, Tirupati, Andhra Pradesh, Pp. 16–26.
- Mohapatra, K.K. and Hussain, S.A. (1988) Avifauna of Chilika Lake. Pp.89–95. In: Patro, S.N (Ed) *Chilika, the pride of our wetland heritage*. Odisha Environmental Society, Bhubaneswar.
- Murthy, T.S.N. (1987) Herpetofauna of the Chilika Lagoon, India. *British Herpetol Bulletin* 21: 8–12.
- Nair, M.V., Panda, S. and Pradhan, A.K. (2014) Hirakud Wetlands, Odisha : A little-known refuge and potential IBA for wintering waterfowl, 186–201 pp. In Gopi, G.V. and S.A. Hussain (Eds.) *Waterbirds of India*, ENVIS Bulletin : Wildlife & Protected Areas. Vol 16; Wildlife Institute of India, Dehradun-248001, India, 368 pp.
- Pandav, B. (1996) Birds of Bhitarkanika Mangroves, Eastern India. *Forktail* 12: 9–20.
- Panigrahi, G., 1983. Vegetational types of Orissa. Survey. Souv. 6th All India . Bot. Conf. Utkal University Bhubaneswar 43–48.
- Palei, H. S. (2012) Sighting of Green Avadavat *Amandava formosa* in Karlapat Wildlife Sanctuary, Odisha, India. *Zoo's Print Magazine* 27 (1): 25.
- Palei, H. S., Mahapatra, P. P., Dutta, S. K., Singh, L. A. K., Sahu, H. K. and Rout, S. D. (2011) Avifauna of Karlapat Wildlife Sanctuary, southern Orissa, India. *Indian Forester* 137: 1197–1202.
- Patanaiik, A.K. (2000) Conservation of Chilika — An Overview. *Wetlands International* 1: 3–5.
- Rahmani, A.R. and Manakadan, R. (1990) The past and present distribution of the Great Indian Bustard *Ardeotis nigriceps* (Vigors) in India. *JBNHS* 87: 175–194.
- Ripely, S.D., Beehler, B.M., and Krishna Raju, K.S.R. (1985) Birds of the Visakhapatnam Ghats, Andhra Pradesh. *JBNHS* 84(3): 540–559 & 85 (1): 90–107.
- Rodgers, W.A., Panwar, H.S. and Mathur, V.B (2000) Wildlife Protected Area Network in India: A review (Executive Summary). Wildlife Institute of India, Dehra Dun. Pp 44.
- Sathiyaselvam, P. Balacandran, S. (2007) A large breeding colony of River Tern *Sterna aurantia* in Chilika Lake, Odisha (India). *IndianBIRDS*. 3(2): 65–66.
- Upreti, D. K., 1996: Lichen on *Shorea robusta* in Jharsuguda district, Orissa, India. *Flora and Fauna Jhansi* 1998; 2(2): pp.159–161.
- Ved et al. 2008
- Whistler, H. and Kinnear, N. B. (1933) The Vernay Scientific Survey of the Eastern Ghats (Ornithological Section). Part 6. *Journal of the Bombay Natural History Society* 36: 832–844.
- ZSI (1993) *Fauna of Orissa-State Fauna Series*. Zoological Survey of India, Kolkata.

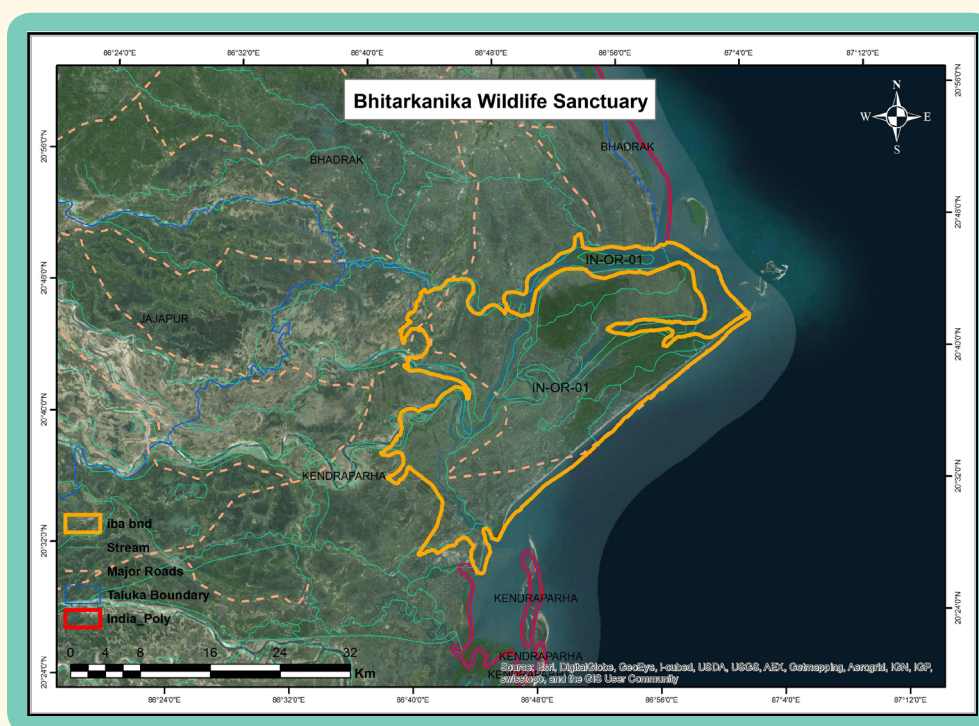
BHITARKANIKA WILDLIFE SANCTUARY AND NATIONAL PARK

IN-OR-01

IBA Site Code	: IN-OR-01	Altitude	: 0–50 msl
State	: Odisha	Rainfall	: 1,200 mm
District	: Kendrapara	Temperature	: 10° C to 40° C
Coordinates	: 20° 45' 00" N, 86° 59' 56" E	Biogeographic Zone	: Coasts
Ownership	: State	Habitats	: Mangroves,
Area	: 81,700 ha		Tropical Moist Deciduous Forest

IBA CRITERIA: A1 (Threatened Species), A4ii ($\geq 1\%$ biogeographic population)

PROTECTION STATUS: Wildlife Sanctuary, notified April, 1975; National Park, established September, 1998.



GENERAL DESCRIPTION

Bhitarkanika Wildlife Sanctuary (67,200 ha) and Bhitarkanika National Park (14,500 ha), located on the eastern coast, together represent one of India's finest mangrove forests. The area was declared as a Wildlife Sanctuary in 1975 to protect the Estuarine or Saltwater Crocodile *Crocodylus porosus* (Kar & Bustard 1981, 1990) but later it was also found to be a haven for birds (Pandav 1996). An area of 2,672 sq. km in this protected area was designated as a Ramsar site in August, 2002.

The sanctuary has a coastline of 35 km on its eastern side from Maipura to Barunei, known as the Gahirmatha coast. The area is laden with rich alluvial silt brought down by Brahmani, Baitarani, and Dhamra rivers and deposited in deltaic areas by regular tidal inundation. Bhitarkanika contains one of the richest and most diversified mangroves in the country. The region has tropical monsoon climate

with three pronounced seasons: winter (October–January), summer (February–May), and monsoon (June–October).

The vegetation is characterized by vast stretches of *Phoenix paludosa*. Pure formations of mangrove tree species such as *Heritiera fomes*, *Excoecaria agallocha*, *Sonneratia apetala*, *Avicennia officinalis*, and *A. marina* occur here. Other dominant mangrove species include *Xylocarpus granatum*, *X. mekongensis*, *X. moluccensis*, *Amoora cucullata*, *Cynometra iripa*, *Brownlowia tersa*, *Bruguiera sexangula*, *B. cylindrica*, *Aegiceras corniculatum*, *Ceriops decandra*, *Rhizophora mucronata*, and *R. apiculata*.

AVIFAUNA

Gopi & Pandav (2007a) conducted a survey in Bhitarkanika from August 2007 to December 2006, during which they recorded 261 species of birds. Bhitarkanika WLS is one of the few protected areas in India which has eight sympatric



DHIRTIMAN MUKHERJEE

Along with Sundarbans in West Bengal, Bhitarkanika represent one of the finest and largest mangroves in the east coast of India. It was declared in 1975 mainly to protect Eastuarine Crocodile *Crocodylus porosus* but also protects 261 bird species, including a large heronry

species of kingfishers: Pied *Ceryle rudis*, Common *Alcedo atthis*, Brown-winged *Halcyon amauropterus*, White-throated *Halcyon smyrnensis*, Black-capped *H. pileata*, Storkbilled *Pelargopsis capensis*, and Collared *Todiramphus chloris*. Ruddy Kingfisher *Halcyon coromanda* was also recorded from this IBA (Anup Nayak, *pers. comm.* to Bishwajit Mohanty).

The Brown-winged and Collared Kingfishers, along with the Mangrove Whistler *Pachycephala cinerea* are mainly restricted to mangroves in India. In the Indian subcontinent, the Mangrove Whistler is otherwise found only in the Sundarbans of West Bengal and Bangladesh, and in a

CRITICALLY ENDANGERED

Baer's Pochard	<i>Aythya baeri</i>
White-rumped Vulture	<i>Gyps bengalensis</i>
Long-billed Vulture	<i>Gyps indicus</i>

ENDANGERED

Spotted Greenshank	<i>Tringa guttifer</i>
Black-bellied Tern	<i>Sterna acuticauda</i>

VULNERABLE

Lesser Adjutant	<i>Leptoptilos javanicus</i>
Pallas's Fish-eagle	<i>Haliaeetus leucoryphus</i>
Greater Spotted Eagle	<i>Clanga clanga</i>
Indian Spotted Eagle	<i>Clanga hastata</i>
Great Knot	<i>Calidris tenuirostris</i>
Indian Skimmer	<i>Rynchops albicollis</i>
Pale-capped Pigeon	<i>Columba punicea</i>

NEAR THREATENED

Spot-billed Pelican	<i>Pelecanus philippensis</i>
Oriental Darter	<i>Anhinga melanogaster</i>
Painted Stork	<i>Mycteria leucocephala</i>
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>
Black-headed Ibis	<i>Threskiornis melanocephalus</i>
Pallid Harrier	<i>Circus macrourus</i>
Red-headed Falcon	<i>Falco chicquera</i>
Great Thick-knee	<i>Esacus recurvirostris</i>
Eurasian Curlew	<i>Numenius arquata</i>
Black-tailed Godwit	<i>Limosa limosa</i>
River Tern	<i>Sterna aurantia</i>
Alexandrine Parakeet	<i>Psittacula eupatria</i>
Brown-winged Kingfisher	<i>Pelargopsis amauroptera</i>
Mangrove Pitta	<i>Pitta megarhyncha</i>
River Lapwing	<i>Vanellus duvaucelii</i>

narrow zone fringing the shore in the Andaman & Nicobar Islands (Ali & Ripley 1987). Karuthedathu *et al.* (2014) stated that the call of Mangrove Pitta *Pitta megarhyncha* was heard in Bhitarkanika. Based on calls, they suspected the presence of three birds. Gopi & Pandav (2007b) also included this bird in their checklist of Bhitarkanika and mentioned that it is fairly common. Nair *et al.* (2014, in prep.) have photographically documented the presence of Mangrove Pitta and its nesting from the IBA. This constitutes the first breeding record of this Near Threatened species from India. In a rapid survey using call playback, they detected the presence of c. 40 pairs from three forest

blocks, and estimated a population of c. 150 pairs in the entire National Park, making this IBA one of the global strongholds for the species.

According to Pandav (1996), 57 species of winter visitors are recorded, with the highest numbers between November and February. The Northern Pintail *Anas acuta* is the most abundant migratory waterfowl. Occurrence of more than 3,000 Black-tailed Godwit *Limosa limosa* is also notable. According to Wetlands International (2012), 1% biogeographical population of this bird is 1,000 individuals, so Bhitarkanika holds c. 3% of the total population of this species.

Eighty-two species are reported breeding, including the Near Threatened Black-necked Stork *Ephippiorhynchus asiaticus*. Bhitarkanika mangroves harbour one of the largest congregations of breeding waterbirds in the country, and one of the five largest heronries in India which hosts around 30,000 birds every year (Subramanya 1996) is located in the Bhitarkanika forest block of the national park. Resident waterbirds are known to nest in this multi-species colony. The breeding birds are Asian Openbill *Anastomus oscitans*, Large Egret *Egretta alba*, Intermediate Egret *Egretta intermedia*, Little Egret *Egretta garzetta*, Grey Heron *Ardea cinerea*, Purple Heron *A. purpurea*, Black-crowned Night-heron *Nycticorax nycticorax*, Little Cormorant *Phalacrocorax niger*, Oriental Darter *Anhinga melanogaster*, and Black-headed Ibis *Threskiornis melanocephalus*.

A count of nest trees and number of nests of all species over three years revealed the presence of 13,704 nests in 3,839 trees (2004), 11,249 nests on 3,237 trees (2005), and 11,819 nests on 4,221 trees (2006) in the heronry.

Only two species now breed in this mixed-species colony, as nine of the 10 species that used to breed have shifted to Matuadia, less than one kilometre away, in Bhitarkanika Forest Block, across Suajore Creek. As of now, only the Asian Openbill and Intermediate Egret nest in this colony. A census carried out in August 2014 in this colony near Suajore

Creek revealed a total of 13,457 Asian Openbill nests and 24 Intermediate Egret nests.

A new colony at the Matha Adia area in the Park has formed amidst the *Excoecaria agallocha* and *Avicennia officinalis* patches, where 10 species breed. A total of 6,303 nests, with 1,671 nests of Asian Openbill, 1073 nests of Large Egret, 612 nests of Intermediate Egret, 170 nests of Little Egret, 536 nests of Purple Heron, 290 nests of Grey Heron, 561 nests of Black-crowned Night-Herons, 290 nests of Oriental Darter, 168 nests of Black-headed Ibis, and 932 nests of Little Cormorant were counted during a census in August, 2014 in the colony (Bijay Kumar Das, *pers. comm.* to Gopi, G.V.).

The Painted Stork *Mycteria leucocephala* also breeds here, but in small numbers. Pandav (1996) could locate only 28 nests on tall trees of *Sonneratia apetala* and *Xylocarpus moluccensis*, away from the main heronry. The Lesser Adjutant *Leptoptilos javanicus* was also observed nesting, its total population estimated to be 20 (Pandav 1996). Gopi & Pandav (2007a) recorded and monitored 13 and 8 nests of Painted Storks in 2005 and 2006 respectively, but only 4 nests of Lesser Adjutant in 2006.

Anup Nayak (*in litt.* 2003) mentioned sighting a flock of more than 50 Indian Skimmer *Rynchops albicollis* in Bhitarkanika in January 2003. Gopi *et al.* (2006) counted 85–110 individuals in December 2005 and January 2006, and have photographed them in Praharajpur Dia area in Hansua river which is nearly 2 km south of Barunei Estuary. Bhitarkanika is a key congregation area for this species in India (Gopi & Pandav, 2007b).

Three species recorded during the survey, but not on the checklist of birds of Odisha prepared by the State Forest Department (Dani 1992), and hence considered new sight records for Odisha, are Eurasian Oystercatcher *Haematopus ostralegus*, Pintail Snipe *Gallinago stenura*, and Chestnut-capped Babbler *Timalia pileata*. The Eurasian Oystercatcher is a common winter visitor to the west coast of India, but is uncommon on the east coast (Ali & Ripley 1987). A group of 19 Eurasian Oystercatchers was seen in the intertidal zone of the Gahirmatha coast during December and January. Pintail Snipe, a winter visitor to India, occurs in northeast India, but is more common in southern India and in the Andaman & Nicobar Islands (Ali & Ripley 1987). In Bhitarkanika, this snipe was seen along the marshy edges of the pools in winter. The southernmost limit of the Chestnut-capped Babbler *Timalia pileata* in India was Calcutta (Ali & Ripley 1987). Small parties of 8–10 birds were observed in the *Phoenix paludosa* bushes in the mangrove forest (Pandav 1996).

OTHER KEY FAUNA

Bhitarkanika WLS and NP, being a highly productive mangrove ecosystem, is also a high biodiversity area. Mammals of 28 species (including cetaceans), 261 species of



DHIRITMAN MUKHERJEE

Bhitarkanika has world's largest breeding ground of the Olive Ridley Sea Turtle *Lepidochelys olivacea* at Gahirmatha, located on its eastern boundary

birds, 42 reptiles, and five species of amphibians have been recorded here (Anon., 2014). The IBA harbours the highest density of Saltwater Crocodile *Crocodylus porosus* in India. It also has the distinction of having the world's largest known breeding ground of the Olive Ridley Sea Turtle *Lepidochelys olivacea* at Gahirmatha, located on its eastern boundary (Das & Kar 1990). Sambar *Rusa unicolor*, Cheetal *Axis axis*, Striped Hyaena *Hyaena hyaena*, and Wild Boar *Sus scrofa* are the other larger animals in the sanctuary. Other interesting mammals include Fishing Cat *Prionailurus viverrinus*, Leopard Cat *Prionailurus bengalensis*, and Smooth-coated Otter *Lutra perspicillata*. Water Monitor *Varanus salvator* and King Cobra *Ophiophagus hannah* are also found in good numbers.

Horse-shoe Crabs *Carcinoscorpius rotundicauda* and *Tachypleus gigas* are also recorded.

LAND USE

- Tourism and recreation
- Nature conservation and research

THREATS AND CONSERVATION ISSUES

- Brackish water prawn culture ponds
- Agriculture
- Disturbance to birds
- Development of Dhamra Port
- Rise in sea level

With the recent changes in land use pattern all along the Odisha coast (evident since 1993), the coastal wetlands and agricultural fields adjoining the wetlands are increasingly being converted into brackish water prawn culture ponds. The wetland adjoining the mangrove forest of Bhitarkanika harbours a good population of migratory waterfowl, and the conversion of coastal wetlands around Bhitarkanika has resulted in the loss of their wintering ground.

Due to the conversion of agricultural fields to prawn culture ponds, the Asian Openbills are losing feeding ground. This may affect the breeding behaviour of these birds and be detrimental to their long-term survival (Pandav 1996).

It has been alleged by NGOs working in Odisha that the large number of Bangladeshi immigrants living and operating around Bhitarkanika are adversely affecting the park and could threaten the survival of the Estuarine

Crocodile. Large-scale mangrove depletion too is attributed to this immigrant population.

Depletion of mangrove cover is a serious problem. Timber and fronds found in mangroves are used for construction and also for firewood by the communities residing in the area.

KEY CONTRIBUTORS

Bivash Pandav, Biswajit Mohanty, Gopi G.V., Manoj V. Nair.

KEY REFERENCES

- Ali, S. and Ripley, S.D. (1987) *Compact Handbook of the Birds of India and Pakistan*. 2nd edn, Oxford University Press, Delhi.
- Anon. (2014) Draft notification of eco-sensitive zone of Bhitarkanika, No. S.O. 2730(E) dated 21.10.2014, Ministry of Environment, Forests & Climate Change, published in The Gazette of India: Extraordinary, Part II-Sec.3(2).
- Dani, C.S. (1992) *A checklist of birds of Orissa*. Wildlife Wing, Forest Department, Government of Orissa.
- Das, C.S. and Kar, S.K. (1990) *The Turtle Paradise – Gahirmatha*. Interprint, New Delhi.
- Gopi, G. and Pandav, B. (2007a) Observations on breeding biology of three storks species in Bhitarkanika mangroves, India. *Indian Birds* 3(2): 45–50.
- Gopi, G. and Pandav, B. (2007b) Avifauna of Bhitarkanika mangroves, India. *Zoos' Print Journal* 22(10): 2839–2847.
- Gopi, G.V., Jena, A.K., and Pandav, B. (2006). Bhitarkanika Wildlife Sanctuary (Orissa), a key congregation area for Indian Skimmer (*Rynchops albigollis*). *Birding Asia* 5: 78.
- Kar, S.K. and Bustard, H.R. (1981) Status of the Saltwater Crocodile (*Crocodylus porosus* Schneider) in the Bhitarkanika Wildlife Sanctuary, Orissa, India. *JBNHS* 86(2): 141–150.
- Kar, S.K. and Bustard, H.R. (1990) Results of a pilot restocking of Saltwater Crocodiles *Crocodylus porosus* Schneider in Bhitarkanika Wildlife Sanctuary, Orissa. *JBNHS* 87: 195–200.
- Karuthedathu, D., Das, V., Parveen, J., Ramachandran, V., Shurpali, S. and Nair, M.V. (2014) Some significant avian records from Odisha. *Indian BIRDS* 9(1): 14–18.
- Pandav, B. (1996) Birds of Bhitarkanika mangroves, eastern India. *Forktail* (12): 9–20.
- Subramanya, S. (1996) Distribution, status and conservation of Indian heronries. *JBNHS* 93(3): 459–486.
- Wetlands International (2012). *Waterbird Population Estimates –Fifth Edition*. Wetlands International, Global Series No. 12. Wageningen, The Netherlands. (online version)
- Links:** <http://southasia.oneworld.net/news/india-human-intervention-depletes-mangrove-forest#.UcgeWnhHTIU> (Accessed on November 25, 2014)

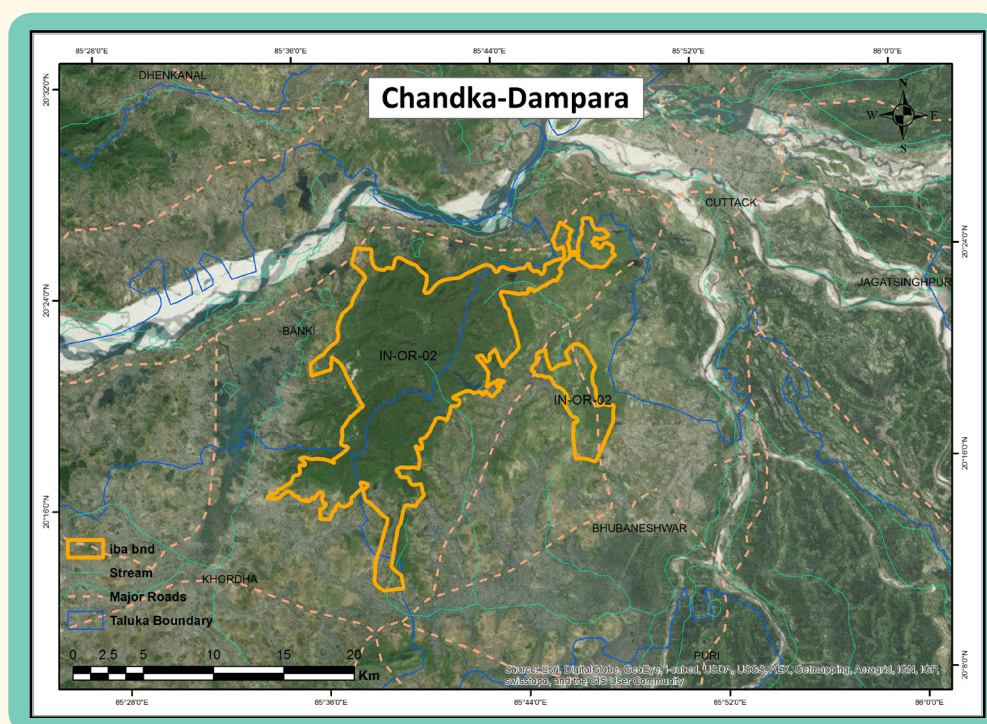
CHANDAKA-DAMPARA WILDLIFE SANCTUARY

IN-OR-02

IBA Site Code	: IN-OR-02	Area	: 17,595 ha
State	: Odisha	Altitude	: 40–202 msl
District	: Khurda, Cuttack	Rainfall	: 1,345 mm
Coordinates	: 20° 21' 00" N, 85° 40' 12" E	Temperature	: 15 °C to 45 °C
Ownership	: State	Biogeographic Zone	: Deccan Peninsula
		Habitats	: Tropical Deciduous Forest

IBA CRITERIA: A1 (Threatened Species), A3 (Biome 11: Indo-Malayan Tropical Dry Zone), A4ii (1% biogeographic population)

PROTECTION STATUS: Wildlife Sanctuary, established in December, 1982.



GENERAL DESCRIPTION

Chandaka was declared a sanctuary for the Asiatic Elephant *Elephas maximus*. It covers major portions of the Chandaka and Dampara Ranges of Puri Forest Division, and forms a compact and contiguous forest tract. The reserve lies to the west of the Cuttack-Khurda road between Barang and Chhatabar, c. 20 km from Bhubaneswar, the capital of Odisha. The ground is generally undulating, interrupted by small hills. The northeastern and central portions are generally flat. The highest peak rises to 202 m (Mishra, undated).

There is no perennial stream or river in the sanctuary, as its topography is such that water drains away rapidly. The situation is further aggravated by deforestation and overgrazing. Kumarkhunti reservoir (100 ha) is the only water reservoir inside the sanctuary that sustains wildlife during the summer.

AVIFAUNA

Kumarkhunti reservoir used to hold breeding populations of c. 5,000 Asian Openbill *Anastomus oscitans* on the bamboo brakes along the shore, but for the past four years the storks are not nesting as the trees have died due to excessive deposition of uric acid from their guano. But with the planting of new trees, the storks are likely to return to breed. Wetlands International (2012) estimates 125,000 as the breeding population of the Asian Openbill in South Asia, which means that before the birds abandoned the nesting colony, c. 4% of the biogeographical population used to breed at this site.

The site lies in Biome 11 (Indo-Malayan Tropical Dry Zone). Of the 59 species listed in Biome 11 from India, 25 have been found at this IBA site, proving that it is a good representative of Biome 11. Two species of Biome 10 (Indian Peninsula Tropical Moist Forest) are also reported from here:

Blue-faced Malkoha *Phaenicophaeus viridirostris* an Indian Scimitar-babbler *Pomatorhinus horsfieldii*.

OTHER KEY FAUNA

Not much is known about the other wildlife of this area, except that it holds a population of c. 70 Asiatic Elephant *Elephas maximus*. Other mammals recorded include Wild Dog *Cuon alpinus*, Leopard *Panthera pardus*, Spotted Deer *Axis axis*, Barking Deer *Muntiacus muntjak*, and Sloth Bear *Melursus ursinus*. Rock Pythons *Python molurus* and Bengal Monitor *Varanus bengalensis* also occur here in good numbers.

CRITICALLY ENDANGERED

White-rumped Vulture	<i>Gyps bengalensis</i>
Long-billed Vulture	<i>Gyps indicus</i>

VULNERABLE

Pale-capped Pigeon	<i>Columba punicea</i>
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BIOME 11: INDO-MALAYAN TROPICAL DRY ZONE

White-eyed Buzzard	<i>Butastur teesa</i>
Rain Quail	<i>Coturnix coromandelicus</i>
Indian Peafowl	<i>Pavo cristatus</i>
Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>
Yellow-footed Green-pigeon	<i>Treron phoenicoptera</i>
Plum-headed Parakeet	<i>Psittacula cyanocephala</i>
Indian Little Nightjar	<i>Caprimulgus asiaticus</i>
Indian Grey Hornbill	<i>Ocyeros birostris</i>
Brown-headed Barbet	<i>Megalaima zeylanica</i>
Yellow-fronted Pied Woodpecker	<i>Dendrocopos mahrattensis</i>
Black-rumped Flameback	<i>Dinopium benghalense</i>
Red-winged Bush-lark	<i>Mirafra erythroptera</i>
Bengal Bush-lark	<i>Mirafra assamica</i>
Common Woodshrike	<i>Tephrodornis pondicerianus</i>
White-browed Bulbul	<i>Pycnonotus luteolus</i>
Indian Robin	<i>Saxicoloides fulicatus</i>
Rufous-bellied Babbler	<i>Dumetia hyperythra</i>
Jungle Babbler	<i>Turdoides striatus</i>
Ashy Prinia	<i>Prinia socialis</i>
Grey-headed Starling	<i>Sturnus malabaricus</i>
Brahminy Starling	<i>Sturnus pagodarum</i>
Bank Myna	<i>Acridotheres ginginianus</i>
White-bellied Drongo	<i>Dicrurus caerulescens</i>

LAND USE

- Tourism and recreation
- Nature conservation and research

THREATS AND CONSERVATION ISSUES

- Agricultural intensification and expansion of industrialization
- Urbanization
- Forest fires
- Man-animal conflict

Owing to its presence close to growing metropolitan cities, Bhuneshwar and Cuttuck, the Chandaka-Dampara Wildlife Sanctuary is today afflicted with numerous

problems: poaching of herbivores such as Cheetal, Sambar and Wild Boar; regular forest fires every year take a heavy toll of the undergrowth and eliminates a lot of ground fauna; over-grazing by cattle; illicit felling of trees for making wood charcoal to meet the demand of road side eateries and hamlets; unregulated collection of NTFP; rapid urbanization with real estate development is going on right on the boundary of the wildlife sanctuary. With high rise building coming up at the doorstep of the wildlife habitat, the issue will only exacerbate the situation in the coming years with the area getting lighted beyond imagination making it no longer suitable for inhabitation of wildlife. There are multiple entry points in the Sanctuary which violates the sanctity of these forests. Cessation of forests and wildlife corridors like Athagarh-Dampara and Chandaka-Barunei due to developmental projects all around, which are critically important for the long term sustenance of long ranging migratory animals like the Elephant and even for accommodating the spillover populations of large carnivores including the tiger (from the Satkosia-Baisipalli region).

There has been a drastic fall in elephant numbers for 2005 onwards, from about individuals to only five in 2014. Earlier, Wild Dog and Grey Wolf were reported but they have not been since the last 3-4 years now.

Inordinate delay in proposal for Ecological Sensitive Zone is one of major reasons as to why Chandaka-Dampara is facing onslaught from the real estate sector. *Wild Orissa*, a local NGO, has been demanding, since 2004, for earmarking



DHRTIMAN MUKHERJEE

Twenty-three out of 59 bird species listed in Biome 11 have been identified till now but more are likely to occur in this IBA as it represents good habitat of this Biome.



DHRITIMAN MUKHERJEE

About 17,600 ha of Tropical Dry Deciduous Forests near Puri was declared as an Elephant Sanctuary in 1982. We identified it as an IBA mainly on the basis of globally Threatened species, Biome-11 species, and a large breeding colony consisting of 5,000 Asain Openbill *Anastomus oscitans*. The breeding colony has disappeared due to the death of nesting trees due to excessive guano

a 10 km radius around the boundary of this protected area as an Eco Sensitive Zone but there has been a failure on this count and the delay which is happening is only worsening the habitat

Purple Wood Pigeon or Pale-capped Wood Pigeon, a globally Vulnerable species is slowly establishing itself in a small part of this protected area. *Wild Orissa* has been monitoring this species since the 1997 and highlighting the conservation imperatives regularly. After a substantial time gap this species was recorded in October 2010 in an area in Bhubaneswar which is contiguous to the Chandaka-Dampara ecosystem. Bird photographers have recorded this species in the outlying areas of Bhubaneswar since 2013

onwards. There is a priority need to enforce restrictions on visitations to sites where this species is being reported in Chandaka-Dampara i.e. the Ekambra Kanan area.

KEY CONTRIBUTORS

Bivash Pandav, B.C. Choudhury, Biswajit Mohanty, Manoj V. Nair, *Wild Orissa*.

KEY REFERENCES

- Mishra, S. K. (undated). *A scheme for Chandaka Elephant Reserve*. Forest Department, Wildlife Wing, Government of Orissa.
- Wetlands International (2012) *Waterbird Population Estimates –Fifth Edition*. Wetlands International, Global Series No. 12. Wageningen, The Netherlands. (online version)

NALABANA WILDLIFE SANCTUARY (CHILIKA LAKE)

IN-OR-03

IBA Site Code : IN-OR-03

State : Odisha

District : Khurda, Puri, Ganjam

Coordinates : 19° 42' 36" N, 85° 28' 48" E

Ownership : State

Area : 1,553 ha [Nalabana] (Chilika 116,500 ha)

Altitude : 0–50 msl

Rainfall : 1,500 mm

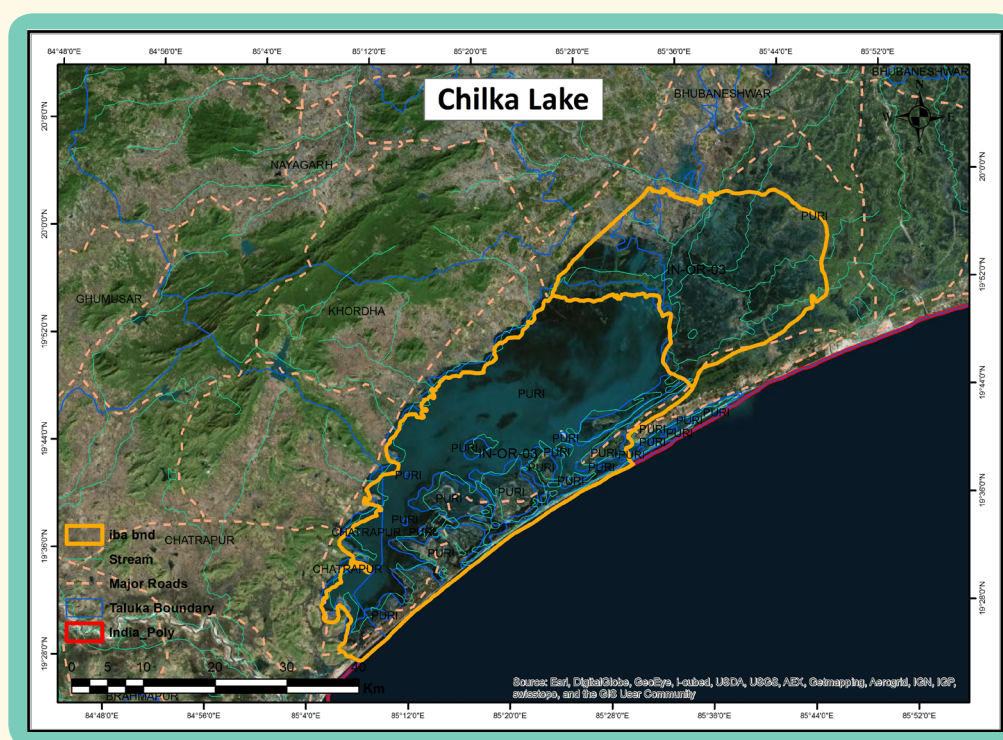
Temperature : 21 °C to 40 °C

Biogeographic Zone : Coasts

Habitats : Brackish Wetland

IBA CRITERIA: A1 (Threatened Species), A1 (Threatened Species), A4i (≥1% biogeographic population), A4iii (≥20,000 waterbirds)

PROTECTION STATUS: Wildlife Sanctuary at Nalabana, established December, 1987.



GENERAL DESCRIPTION

Chilika Lake is an estuarine lagoon, shallow throughout its spread of 116,500 ha. It is the largest brackish-water wetland in India (Kar & Sahu 1993). The Government of India notified Chilika Lake as a Ramsar site in 1981. This pear-shaped lake is connected to the Bay of Bengal at its northeastern end and is subject to minor tidal fluctuations. It receives water from Rivers Daya and Bhargavi, and several small streams. It is the largest wintering ground for migratory waterfowl in India (Anon. 2000).

According to historical evidence, Chilika Lake was part of the Bay of Bengal c. 6,000 years ago. Merchant ships used to travel from Chilika to Southeast Asia (Trisal & Chauhan 1998). Over a period of time, a sand spit barrier formed due to the littoral drift of the sea, as well as silt deposits brought down by adjoining rivers into the wetland, separating it from

the Bay of Bengal. The Chilika Development Authority has opened the sea-inlet to allow sea water in the Chilika Lake, resulting in restoration of natural ecosystem and increase in fish catch (Ajith Patnaick *pers. comm.* 2004).

Several islands are located in Chilika lagoon covering an area of 22,300 ha. One of these, namely Nalabana Island with an area of 1,553 ha, was declared as a bird sanctuary in 1987. Nalabana literally means 'forest of reeds'. It is covered with aquatic plants, predominantly *Phragmites karka*. During monsoon, Nalabana is entirely submerged, with only reeds and a watchtower visible. With the onset of summer, the island gradually emerges.

The major flora comprises aquatic macrophytes such as *Potamogeton pectinatus*, *Najas faveolata*, *N. graminea*, *Halophila ovalis*, *Ruppia maritima*, *Phragmites karka*, *Scirpus littoralis*, *Cyperus* sp., and *Salicornia brachiata*.



DHIRTIMAN MUKHERJEE

Although BirdLife International has listed Black-tailed Godwit *Limosa limosa* as Near Threatened based on decline at the global level, it is very common in shallow waters of Chilika, sometimes occurring in thousands

The algal forms include *Chaetomorpha linum*, *Enteromorpha intestinalis*, *Oscillatoria laetevineus*, *Cladophora glomerata*, *Ulva lactuca*, and the less common *Gracillaria verrucosa*.

AVIFAUNA

Chilika Lake in general and Nalabana Island in particular are among the most important waterfowl habitats in India. The total number of waterfowl in Chilika is close to 800,000. Balachandran *et al.* (2009) reported 224 species of birds from this IBA.

In January 2003, more than 450,000 birds were counted on Nalabana Island, and more than 240,000 in the northern sector from Kalupadaghat to Teenmuhani area. Huge numbers of birds were also observed in the Kansari river and Gangadharpur area (Sana Nairi village). Similarly, unapproachable areas in the southern sector near Taltaola, Rambha, Naupada, and outer-channel Jahnikuda provide refuge to more than 170,000 ducks and waders. It is estimated that Chilika Lake supported over 800,000 birds during the 2002–2003 winter season (Balachandran *et al.* 2003).

Large numbers of birds such as the Northern Pintail *Anas acuta* (80,000–100,000), Garganey *Querquedula querquedula* (70,000), Gadwall *Mareca strepera* (100,000), Eurasian Wigeon *A. penelope* (40,000), Common Teal *Anas crecca* (10,000), Red-crested Pochard *Rhodonessa rufina* (5,000), Black-tailed Godwit *Limosa limosa* (48,000), Brown-headed Gull *Larus brunnicephalus* (20,000), and

the marine terns Large Crested *Sterna bergii* and Lesser Crested *S. bengalensis* congregate on and around the island at dusk to roost, and most of them depart in the morning (Balachandran *et al.* 2009). Over 1,000 Bar-headed Geese *Anser indicus* spend the winter at Nalabana every year. During three years of monitoring, the maximum wader population (144,000) was recorded in January 2003. The rare Asian Dowitcher *Limnodromus semipalmatus* was seen in small numbers (10–15) and five individuals were ringed between 2002 and 2003. Large congregations (>1,000) of Lesser Whistling-duck *Dendrocygna javanicus* were seen during January 2003. Over 5,000 Ruddy Shelduck *Tadorna ferruginea* were observed between Satapada (outer-channel area) and Nalabana.

The globally Threatened Pallas's Fish-eagle *Haliaeetus leucoryphus* was regularly sighted, solitarily or in pairs in Nalabana from December to March. Among other threatened species, 175–300 Spot-billed Pelican were seen on Chilika Lake.

The Cotton Pygmy-goose *Nettapus coromandelianus* generally lives in small flocks of 5–8 individuals, but in this IBA (and Mangalajodi, another IBA), huge congregations are sometimes seen. For example, on two occasions more than 5,000 were observed, once in January 2003, and then in December 2006, between Kaluparaghat and Tinimuhani. These are the two largest congregations recorded of this species in India (Balachandran *et al.* 2009).

During 2003-04, about 850 Black-headed Ibis *Threskiornis melanocephalus* were records (Balachandran *et al.* 2009). The 1% threshold of this Near Threatened species is 250 (Wetlands International 2012). Another NT species with huge numbers occurring in Nalalabana is the Painted Stork *Mycteria leucocephala*. In May 2002, about 5,000 were estimated. Less numbers were seen in subsequent years.

Special mention should be made of Great Knot *Calidris tenuirostris*, a globally Vulnerable species and an uncommon bird in India. One individual was ringed at Parikund in December 2002, and a few individuals were seen in the 2004-05 winter season (Balachandran *et al.* 2009).

Large breeding colonies of terns, namely the River Tern *Sterna aurantia*, Gull-billed Tern *Gelochelidon nilotica*, and Little Tern *Sterna albifrons*, along with waders such as Black-winged Stilt *Himantopus himantopus* were recorded at Nalabana Island. The majority of nests were found in the middle of the island. Among the 1,032 nests noted in 2002, 540 and 323 respectively belonged to River Tern and Gull-billed Tern. Sathiyaselvam & Balachandran (2007) observed a breeding colony of River Tern for three years. They reported 540, 476, and 304 nests from 2002, 2003, and 2004 respectively. The other two wader species breeding at Nalabana are Oriental Pratincole *Glareola maldivarum* and Kentish Plover *Charadrius alexandrinus* (Balachandran *et al.* 2002a).

Many waders and ducks occur in much greater numbers than their 1% population threshold determined by Wetlands

CRITICALLY ENDANGERED

Baer's Pochard	<i>Aythya baeri</i>
Spoon-billed Sandpiper	<i>Eurynorhynchus pygmeus</i>

ENDANGERED

Black-bellied Tern	<i>Sterna acuticauda</i>
Spotted Greenshank	<i>Tringa guttifer</i>

VULNERABLE

Dalmatian Pelican	<i>Pelecanus crispus</i>
Asian Woollyneck	<i>Ciconia episcopus</i>
Lesser Adjutant	<i>Leptoptilos javanicus</i>
Lesser White-fronted Goose	<i>Anser erythropus</i>
Pallas's Fish-eagle	<i>Haliaeetus leucoryphus</i>
Greater Spotted Eagle	<i>Clanga clanga</i>
Great Knot	<i>Calidris tenuirostris</i>
Indian Skimmer	<i>Rynchops albicollis</i>

NEAR THREATENED

Spot-billed Pelican	<i>Pelecanus philippensis</i>
Oriental Darter	<i>Anhinga melanogaster</i>
Painted Stork	<i>Mycteria leucocephala</i>
Black-headed Ibis	<i>Threskiornis melanocephalus</i>
Lesser Flamingo	<i>Phoeniconaias minor</i>
Ferruginous Duck	<i>Aythya nyroca</i>
Pallid Harrier	<i>Circus macrourus</i>
Red-headed Falcon	<i>Falco chicquera</i>
Great thick-knee	<i>Esacus recurvirostris</i>
Eurasian Curlew	<i>Numenius arquata</i>
Black-tailed Godwit	<i>Limosa limosa</i>
Asian Dowitcher	<i>Limnodromus semipalmatus</i>
River Tern	<i>Sterna aurantia</i>



Perhaps the largest congregation of ducks occurs in Chilika, particularly in Nalaban. More than 800,000 have been estimated in some years

DHIRTIMAN MUKHERJEE

International (2012). For some species such as the Spoon-billed Sandpiper *Eurynorhynchus pygmaeus* and Asian Dowitcher, this site is extremely important in India.

OTHER KEY FAUNA

A remnant population of the highly endangered Irrawaddy Dolphin *Orcaella brevirostris* occurs in Chilika. The lake hosts 158 species of fish and prawn. Fish include both marine and estuarine species. *Penaeus indicus* and *P. monodon* are commercially important prawns. The Sand Crab *Scylla serrata* is the most abundant commercial crab of Chilika.

Irrawaddy Dolphin population estimated during 2003–2012 is as follows:

Year	Adult	Sub-adult	Calf	Total	Casualty
2003	70	11	8	89	16
2004	103	10	11	124	11
2005	102	8	1	111	17
2006	119	7	5	131	4
2007	115	15	5	135	8
2008	115	17	6	138	6
2009	111	18	17	146	10
2010	129	14	15	158	1
2011	131	21	4	156	1
2012	112	14	10	145	1

LAND USE

- Tourism and recreation
- Nature conservation and research
- Fishing

THREATS AND CONSERVATION ISSUES

- Indiscriminate fishing
- Pollution
- Poaching of birds

Chilika Lake has undergone major ecological changes over the last several years, mostly due to the salinity changes caused by choking of the outer-channel, closure of the lake mouth to the sea, and the restoration measures (providing of a new mouth) undertaken by the Chilika Development Authority.

Nalabana Island has large breeding colonies of Gull-billed and River Terns. But at the onset of monsoon in May, many nests are washed away by floods caused by heavy rain and wind. Near total breeding failure was noticed in these two terns in 2002 and over 75% in 2003 (Balachandran *et al.* 2002a, 2002b, 2003). River Tern nests are generally prone to flooding in most of their breeding areas (Ali & Ripley 1987), but poor breeding success in this largest colony will have

a particularly adverse effect on this species. Conservation measures are urgently needed for the terns to protect them from natural calamities.

Nalabana being a popular tourist destination witnesses a large number of visitors who litter the place which is a grave threat. This litter is periodically burnt off which releases noxious gases that obviously shall affect the birds since most of the waste is plastic wrappers and bags (Biswajit Mohanty *pers. comm.* 2004). The birds are also adversely affected by the increasing number of mechanized boats plying in the area, which emit smoke, noise, and oil pollution.

KEY CONTRIBUTORS

S. Balachandran, Biswajit Mohanty, Ajit Patnaik, Manoj V. Nair.

KEY REFERENCES

- Ali, S. and Ripley, S.D. (1987) *Compact Handbook of the Birds of India and Pakistan*. 2nd edn. Oxford University Press, Delhi.
- Anon. (2002) Conservation of Chilika - an overview. *Chilika Wetland International Newsletter* 1: 3–5.
- Balachandran, S., Rahmani, A.R. and Sathiyaselvam, P. (2002a) Habitat evaluation of Chilika Lake with special reference to birds as Bioindicators. Half yearly Report (December 2001 to June 2002). Bombay Natural History Society, Mumbai.
- Balachandran, S., Rahmani, A.R. and Sathiyaselvam, P. (2002b). Habitat evaluation of Chilika Lake with special reference to birds as Bioindicators. Half yearly Report (July to December 2002). Bombay Natural History Society, Mumbai.
- Balachandran, S., Rahmani, A.R. and Sathiyaselvam, P. (2003) Habitat evaluation of Chilika Lake with special reference to birds as Bioindicators. Annual Report, Bombay Natural History Society, Mumbai.
- Balachandran, S., Sathiyaselvam, P. and Panda, S. (2009) *Bird Atlas of Chilika*. Bombay Natural History Society, Mumbai and Chilika Development Authority, Bhubaneswar. Pp. 326.
- Kar, S.K. and Sahu, H.K. (1993) Preliminary study on ecology of aquatic birds in Chilika lake, Orissa. In: Verghese, A., Sridhar, S., and Chakravathy, V.K. (Eds) *Bird Conservation: Strategies for the nineties and beyond*. Ornithological Society of India, Bangalore. Pp. 62–64.
- Sathiyaselvam, P. & Balachandran, S. (2007) A large breeding colony of River Tern *Sterna aurantia* in Chilika lake, Orissa (India). *Indian Birds* 3(2) :65–66.
- Trisal, C.L. and Chauhan, M. (1998) Chilika Lake: Guidelines for Ecotourism Development. Wetlands International-South Asia, New Delhi, India. Pp. 54.
- Wetlands International (2012) *Waterbirds Population Estimates: Fifth Edition*. Wetlands International, Global Series No. 12. Wageningen, The Netherlands. (online version)
- Links:** <http://indiannewsdiary.com/?p=1405>

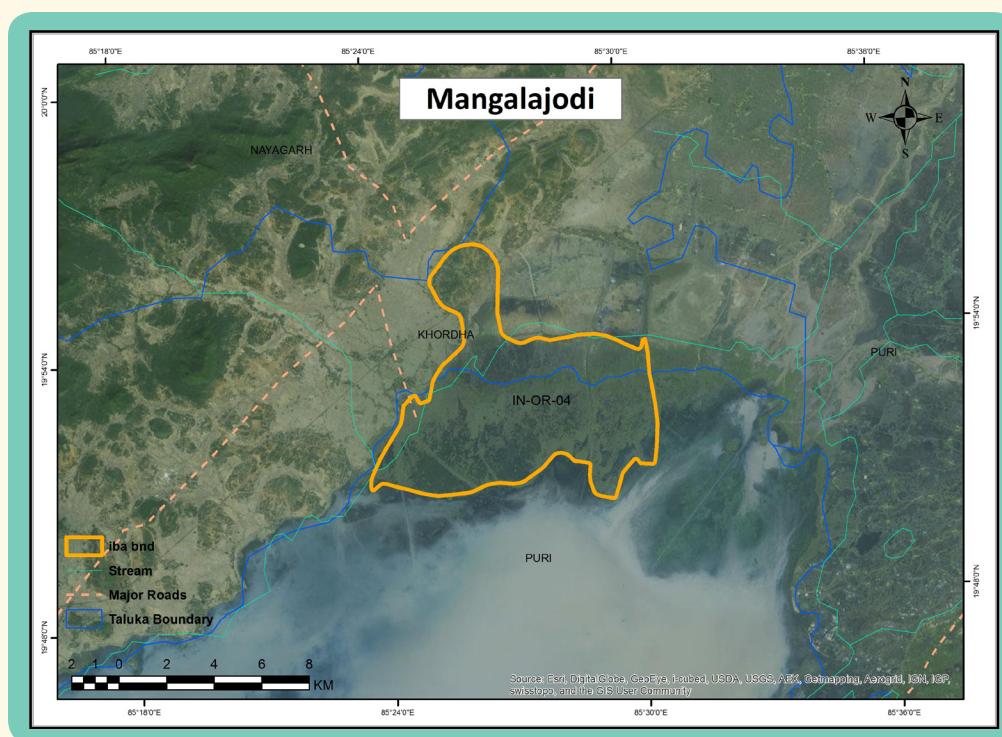
MANGALAJODI

IN-OR-04

IBA Site Code	: IN-OR-04	Area	: 7,038 ha
State	: Odisha	Altitude	: c.70 msl
District	: Khurda	Rainfall	: Not available
Coordinates	: 20° 10' 00" N, 85° 37' 00" E	Temperature	: 15 oC to 45 oC
Ownership	: Revenue Land and some parts owned by the local people and community	Biogeographic Zone	: Deccan Peninsula
		Habitats	: Wetlands, Reedbeds

IBA CRITERIA: A1 (Threatened species), A4i ($\geq 1\%$ biogeographic population), A4iii ($\geq 20,000$ waterbirds)

PROTECTION STATUS: Not officially protected. However, since last several years, the local community supported by the Forest Department, Chilika Development Authority and many civil society organisations have been actively engaged in bird and habitat conservation. There are some efforts on to declare it a Community Conservation Reserve.



GENERAL DESCRIPTION

Mangalajodi village is located c. 5 km from Tangi in district Khurda, 60 km from Bhubaneswar. It is one of the villages surrounding Chilika Lake. This village is connected to the northern sector of Chilika Lake and Kalupada Ghat by way of channels dug through *Phragmites karka* reed beds. The area includes Mangalajodi Ghera. Mangalajodi is primarily a freshwater zone with marshes, emergent vegetation, and reed beds consisting mostly of *Typha elephantina* and *Phragmites karka*.

The extensive wetlands have a main broad channel running north to south for about four kilometers with numerous side channels branching and then again looping back to form a criss-crossing maze of reed-lined waterways. There is an embankment (also serving as a

Nature Trail) which runs alongside for about two kilometers at the end of which is a Watch Tower erected by the Forest Department.

Mangalajodi is a part of Chilika but basically it is a freshwater zone, adjoining the northern sector of the Chilika Lake with marshes, emergent vegetation and reed beds. Approximately 5,859 ha consists of emergent vegetation dominated by *Phragmites*, and 1,179 ha of marshland with wet meadows (Balachandran *et al.* 2009). Exclusive *Phragmites* and reeds provide shelter for freshwater birds such as Eurasian Coot *Fulica atra*, Common Moorhen, rails, crakes, migratory warblers and bitterns.

Mangalajodi is one of the finest examples of community involvement in the protection of wildlife (Pathak 2009). In December, 2000, a bird protection committee, Sri Mahavir

DHITIMAN MUKHERJEE



Hundreds of thousands of waterfowl are found in Mangalajodi, many representing more than 1% population threshold determined by Wetland International. This is thanks to community efforts backed by NGOs and Forest Department

Pakshi Surakshya Samiti of Mangalajodi, was constituted by Wild Orissa, a local NGO. Since then, there has been a drastic fall in the frequency of bird poaching, as Wild Orissa was able to convince the poachers to turn into bird tourist guides and fishermen. The poachers, who once hunted birds, now participate in the surveillance and patrolling, and work with the Forest Department.

AVIFAUNA

The marshes around Mangalajodi, and the open water between Kalupara Ghat and Teenmuhani, attract a large congregation of waterfowl, especially dabbling ducks such as Northern Pintail *Anas acuta*, Northern Shoveller *Spatula clypeata*, Garganey *Querquedula querquedula*, and Brahminy Duck or Ruddy Shelduck *Tadorna ferruginea*. About 150 species of migratory birds and 40 species of resident birds have been recorded here (Ukil, 2014).

A huge population of waterfowl is found on this site. The estimates were over 300,000 and 240,000 respectively, for 2002 and 2003 (S. Balachandran, *pers. comm.* 2003). Populations of at least 15 species exceed 1% of their bio-geographical population, as estimated by Wetlands International (2012). More than 100,000 Tufted Pochard *Aythya fuligula*, representing 10% of the geographical population, have been recorded. Red-crested Pochard *Netta rufina* also occurs in tens of thousands, along with Large Whistling Duck *Dendrocygna bicolor* (14,500) and Lesser Whistling Duck *D. javanicus* (2,800).

The reed beds are frequented by more than 10,000

Purple Moorhen or Swampen *Porphyrio poliocephalus*, 15,000 Asian Openbill *Anastomus oscitans*, 15,000 Common Moorhen *Gallinula chloropus*, and more than 5,000 Cotton Teal or Cotton Pygmy-goose *Nettapus coromandelicus*. Over 400 Grey-headed Lapwing *Vanellus cinereus* were counted in Mangalajodi area, which is more than 1% of their biogeographical population (Balachandran *et al.* 2002a, b, 2003). The reed beds are also roosting sites for many thousands of Streaked Weaver *Ploceus manyar* and Baya Weaver *Ploceus philippinus*, Indian Great Reed-warbler or Clamorous Reed-warbler *Acrocephalus stentoreus*, Asian Pied Starling *Sturnus contra*, and Red Munia or Red Avadavat *Amandava amandava*.

Near Threatened Black-tailed Godwit *Limosa limosa* is found in huge numbers, sometimes exceeding two to three thousand birds. Balachandran *et al.* (2009) have identified

VULNERABLE

Lesser White-fronted Goose	<i>Anser erythropus</i>
Greater Spotted Eagle	<i>Clanga clanga</i>
Indian Spotted Eagle	<i>Clanga hastata</i>

NEAR THREATENED

Oriental Darter	<i>Anhinga melanogaster</i>
Ferruginous Duck	<i>Aythya nyroca</i>
Spot-billed Pelican	<i>Pelecanus philippensis</i>
Painted Stork	<i>Mycteria leucecephala</i>
Black-headed Ibis	<i>Threskiornis melanocephalus</i>
Red-headed Falcon	<i>Falco chicquera</i>
Black-tailed Godwit	<i>Limosa limosa</i>
Eurasian Curlew	<i>Numenius arquata</i>
River Tern	<i>Sterna aurantia</i>

224 species of birds in the Chilika Lake, most species occur in Mangalajodi area. A pair of Lesser White-fronted Goose *Anser erythropus* was recorded in December 2004, in marshes between Sundarpur and Basundpur, close to Mangalajodi (Balachandran *et al.* 2009).

Mangalajodi is also a site where normally hard-to-see skulking rallids such as Slaty-breasted Rail *Gallirallus striatus*, Ruddy-breasted Crake *Porzana fusca*, Baillon's Crake *Porzana pusilla*, Spotted Crake *Porzana porzana* and four species of bitterns – Eurasian *Botaurus stellaris*, Black *Dupetor flavicollis*, Cinnamon *Ixobrychus cinnamomeus* and Yellow *Ixobrychus sinensis* are found. Among other rarities recorded here are the Greater Spotted Eagle *Clanaga clanga*, Goliath Heron *Ardea goliath* and Plaintive Cuckoo *Cacomantis merulinus* (Manoj V. Nair, *in litt.* 2014).

OTHER KEY FAUNA

The rare Fishing Cat *Prionailurus viverrinus* and Smooth-coated Otter *Lutra perspicillata* are reported to be present in Mangalajodi.

LAND USE

- Agriculture
- Fishing

THREATS AND CONSERVATION ISSUES

- Increasing tourism pressure
- Reed harvesting

Thanks to the efforts of various conservation NGOs and the Forest Department of Odisha, Mangalajodi is now a shining example, with ex-poachers becoming bird tourist guides and taking people out for birdwatching. Mangalajodi has become a much sought after ecotourism destination in Odisha and has seen manifold increase in footfall, especially photographers. Private businesses have come up, providing facilities for stay and travel coupled with trained eco-guides, providing income for many families and engages the members of the bird protection committee. Chilika Lake, a Ramsar Site, has been declared as a Destination Flyway recently by the United Nations World Tourism Organization.

At the same time, increasing tourism is now putting pressure on the infrastructure and bird habitats, as boat rides have increased and many ill-conceived initiatives have been taken. There is a need to restrict the entry of boats into designated areas, to provide sanitation facilities and designated parking area for vehicles, strengthening the earthen embankment, and regular monitoring of the impacts of tourism. In order to address these issues, a stakeholders' meeting was organized in February, 2014 during which many initiatives were approved to improve tourism facilities and protect the habitat (Monalisa Bhujabal, *in litt.* 2014).

KEY CONTRIBUTORS

S. Balachandran, Monalisa Bhujabal, Manoj V. Nair, Wild Orissa.

KEY REFERENCES

- Balachandran, S., Rahmani, A.R., and Sathiyaselvam, P. (2002a) Habitat evaluation of Chilika Lake with special reference to birds as Bioindicators. Half yearly Report (December 2001 to June 2002). Bombay Natural History Society, Mumbai.
- Balachandran, S., Rahmani, A.R., and Sathiyaselvam, P. (2002b) Habitat evaluation of Chilika Lake with special reference to birds as Bioindicators. Half yearly Report (July to December 2002) Bombay Natural History Society, Mumbai.
- Balachandran, S., Rahmani, A.R., and Sathiyaselvam, P. (2003) Habitat evaluation of Chilika Lake with special reference to birds as Bioindicators. Annual Report. Bombay Natural History Society, Mumbai.
- Balachandran, S., Sathiyaselvam, P. and Panda, S. (2009) *Bird Atlas of Chilika*. Bombay Natural History Society, Mumbai, and Chilika Development Authority, Bhubaneswar. Pp 326.
- Pathak, N. (Ed.) (2009) *Community Conserved Areas in India – A Directory*. Kalpavriksh, Pune/Delhi. Pp. 812.
- Ukil, P.M. (2014) The magic of Mangalajodi. *Sanctuary Asia* Vol. XXXV No. 2, April 2014.
- Wetlands International (2012) *Waterbirds Population Estimates: Fifth Edition*. Wetlands International Global Series No. 12. Wageningen, The Netherlands. (online version)

Links:

<http://mangalajodiecotourism.com/birds-and-biodiversity.php>

SATKOSIA GORGE TIGER RESERVE

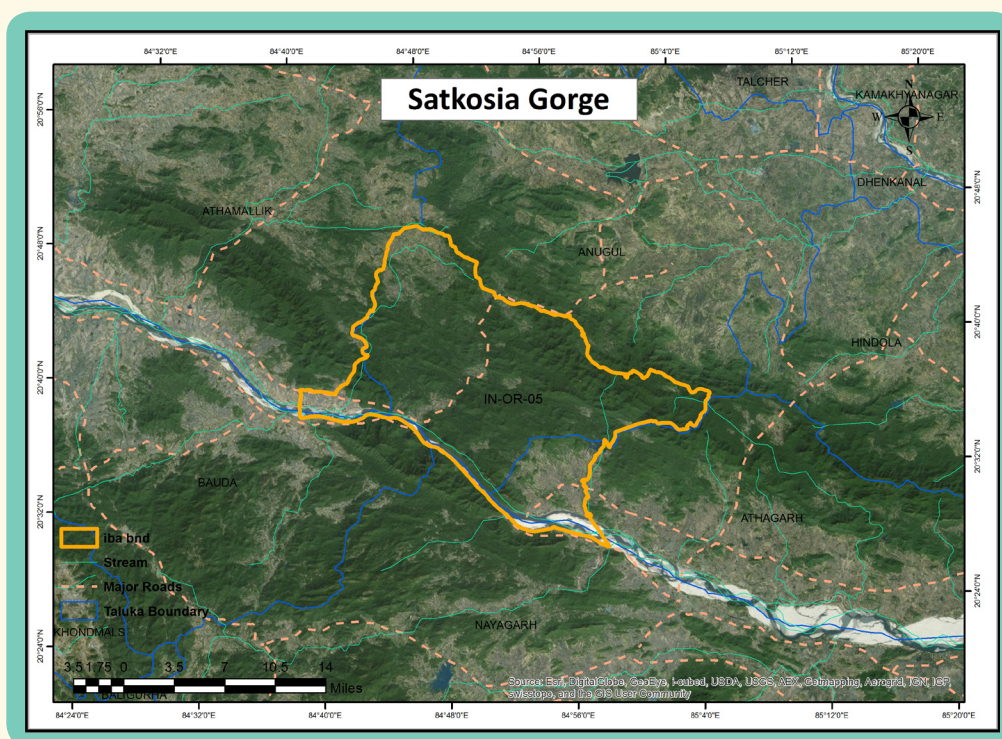
IBA Site Code	: IN-OR-05
State	: Odisha
District	: Dhenkanal, Cuttack, Puri, Phulbani
Coordinates	: 20° 33' 07" N, 84° 56' 51" E
Ownership	: State
Area	: 74,552 ha

Altitude	: 63–926 msl
Rainfall	: 1,500 mm
Temperature	: 15 °C to 40 °C
Biogeographic Zone	: Deccan Peninsula
Habitats	: Tropical Dry Deciduous Forest, Tropical Moist Deciduous Forest

IN-OR-05

IBA CRITERIA: A1 (Threatened species), A3 (Biome 10: Indian Peninsula Tropical Moist Forest, Biome 11: Indo-Malayan Tropical Dry Zone)

PROTECTION STATUS: Tiger Reserve, established December 31, 2007.



GENERAL DESCRIPTION

Satkosia Gorge Sanctuary, now a Tiger Reserve, lies on either side of the River Mahanadi, in the districts of Dhenkanal, Cuttack, Puri, and Phulbani. The name Satkosia refers to the 14-mile long, deep gorge formed on the Mahanadi (*saat* = seven, *kos* = two miles). The area can be broadly classified under woodland ecosystem, except for the freshwater aquatic ecosystem in the gorge. The sanctuary extends over 79,552 ha, including a 32 km stretch of riverbed (Choudhury, undated).

The area was declared a sanctuary mainly to protect the Gharial *Gavialis gangeticus* and Mugger *Crocodylus palustris*. This is one of the few riverine sanctuaries in India. Satkosia Gorge WLS was declared as a tiger reserve under Project Tiger in 2007.

The woodland ecosystem can be classified as Northern Tropical Moist Deciduous Forest and Northern Tropical Dry Deciduous Forest. *Sal Shorea robusta* is the dominant tree in the former type. The canopy is irregular, with trees of unequal ages. Owing to the remote and difficult terrain, not much deforestation has occurred. The dry deciduous forest is bare and leafless in summer. The main species are *Anogeissus latifolia*, *Terminalia tomentosa*, *Haldina cordifolia*, and *Albizia lebbek*.

AVIFAUNA

Besides the two Critically Endangered *Gyps* vultures, which are widespread in any case, this site harbours two globally Threatened species: Indian Skimmer *Rynchops albigollis* and Bristled Grass-warbler or Grassbird *Chaetornis*

striatus. The Indian Skimmer breeds on the islands in the Mahanadi river (B.C. Choudhury, *pers. comm.* 2003).

This site is designated as an IBA based on the presence of these two globally Threatened species, and also as it is a breeding site of the Indian Skimmer.

The birdlife is fairly typical of eastern India. Of the 59 species listed in Biome 11 by BirdLife International (undated), 32 are found at this site. Four species of Biome 10 (Indian Peninsula Tropical Moist Forest) are also reported, i.e., Malabar Trogon *Harpactes fasciatus*, Malabar Pied Hornbill *Anthracoceros coronatus*, Indian Scimitar-babbler *Pomatorhinus horsfieldii*, and Blue-faced Malkoha *Phaenicophaeus viridirostris*. These are at the northeastern extreme of their range.

Ripley (1978), in his paper on the bird fauna of the Simlipal forest area in Mayurbhanj and Dhenkanal districts, mentions Tytler's Leaf-warbler *Phylloscopus tytleri* "in forest near the Mahanadi river in Dhenkanal District". This interesting record extends the winter range considerably east from the River Tapti in Madhya Pradesh. It seems to have been missed out in Ali & Ripley (1987) and Grimmett *et al.* (1998).

Thick-billed Green-pigeon *Treron curvirostra* is a resident bird of the Himalaya and north-eastern India, but Singh (2010) sighted four Thick-billed Green-pigeon at Labangi watchtower, at the north-eastern boundary of Satkosia on May 3, 2009. The birds were observed to be feeding with a flock of Emerald Dove *Chalcophaps indica*.

According to Monalisa Bhujabal (*pers. comm.* 2014) of the NGO Wild Orissa, Pale-capped Wood-pigeon *Columba punicea* has been seen in Satkosia-Baisipalli forests.

OTHER KEY FAUNA

Most of the representative large vertebrates of tropical dry deciduous forests of the Indian plains are found in Satkosia WLS, such as Tiger *Panthera tigris*, Leopard *P. pardus*, Sloth Bear *Melursus ursinus*, Wild Dog *Cuon alpinus*, Gaur *Bos gaurus*, Chital *Axis axis*, Barking Deer or Indian Muntjac *Muntiacus muntjak*, Blue Bull or Nilgai *Boselaphus tragocamelus*, Four-horned Antelope *Tetracerus quadricornis*, and Wild Boar *Sus scrofa*, as well as the Asiatic Elephant *Elephas maximus*.

LAND USE

- Nature conservation and research
- Tourism and recreation

THREATS AND CONSERVATION ISSUES

- Fishing
- Poaching
- Fragmentation of habitat by canals
- Livestock grazing
- Tourism
- Forest fires



DHIRTIMAN MUKHERJEE

Satkosia Gorge has been declared as a Tiger Reserve but not many people know that it is one of the finest breeding sites in India for the Vulnerable Indian Skimmer *Rynchops albicollis*

CRITICALLY ENDANGERED

White-rumped Vulture	<i>Gyps bengalensis</i>
Long-billed Vulture	<i>Gyps indicus</i>

VULNERABLE

Indian Skimmer	<i>Rynchops albicollis</i>
Pale-capped Wood-pigeon	<i>Columba punicea</i>
Bristled Grass-warbler	<i>Chaetornis striata</i>

NEAR THREATENED

Malabar Pied Hornbill	<i>Anthraceroceros coronatus</i>
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BIOME 10: INDIAN PENINSULA TROPICAL MOIST FOREST

Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>
Malabar Trogon	<i>Harpactes fasciatus</i>
Indian Scimitar-babbler	<i>Pomatorhinus horsfieldii</i>

BIOME 11: INDO-MALAYAN TROPICAL DRY ZONE

White-rumped Vulture	<i>Gyps bengalensis</i>
Long-billed Vulture	<i>Gyps indicus</i>
White-eyed Buzzard	<i>Buteo teesa</i>
Rain Quail	<i>Coturnix coromandelica</i>
Jungle Bush-quail	<i>Perdica asiatica</i>
Indian Peafowl	<i>Pavo cristatus</i>
Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>
Yellow-footed Green-pigeon	<i>Treron phoenicoptera</i>
Plum-headed Parakeet	<i>Psittacula cyanocephala</i>
Sirkeer Malkoha	<i>Phaenicophaeus leschenaultii</i>
Common Indian Nightjar	<i>Caprimulgus asiaticus</i>
Indian Grey Hornbill	<i>Ocyroceros birostris</i>
Brown-headed Barbet	<i>Megalaima zeylanica</i>
Yellow-fronted Pied Woodpecker	<i>Dendrocopos mahrattensis</i>
Black-rumped Flameback	<i>Dinopium benghalensis</i>
Red-winged Bushlark	<i>Mirafra erythroptera</i>
Bengal Bushlark	<i>Mirafra assamica</i>
Ashy-crowned Sparrowlark	<i>Eremopterix grisea</i>
Black-headed Cuckooshrike	<i>Coracina melanoptera</i>
Small Minivet	<i>Pericrocotus cinnamomeus</i>
Common Woodshrike	<i>Tephrodornis pondicerianus</i>
White-browed Bulbul	<i>Pycnonotus luteolus</i>
Indian Robin	<i>Saxicoloides fulicata</i>
Rufous-bellied Babbler	<i>Dumetia hyperythra</i>
Jungle Babbler	<i>Turdoides striatus</i>
Jungle Prinia	<i>Prinia sylvatica</i>
Ashy Prinia	<i>Prinia socialis</i>
White-browed Fantail-flycatcher	<i>Rhipidura aureola</i>
Grey-headed Starling	<i>Sturnus malabaricus</i>
Brahminy Starling	<i>Sturnus pagodarum</i>
Bank Myna	<i>Acridotheres ginginianus</i>
White-bellied Drongo	<i>Dicrurus caerulescens</i>

After the declaration of Satkosia Gorge Wildlife Sanctuary as a tiger reserve in 2007, the PA enjoys better protection levels. However, trapping and illegal trade in wildlife including birds continues on a small scale. There is need for intensive engagement with local communities to stop such activities.

In order to allow industrial development, the State Government has sent a proposal for partial denotification

of the reserve, which is being opposed by local NGOs. Large projects in the periphery including thermal plants and industries in Athagarh and Dhenkanal are coming up. The National Board for Wildlife, Government of India is totally opposed to the denotification proposal, and instead of denotification, the Board and conservation NGOs have suggested to include the adjoining areas of Boudh and Kandhama in the tiger reserve.

There are 53 villages inside the reserve, and there is immense pressure due to fishing on the Mahanadi river, although it was banned on a 27 km stretch of the river to protect the Gharial. These villages inside the sanctuary are a grave threat, since the inhabitants carry out a number of unsustainable activities including goat and cattle grazing in large numbers. Most of the fertile valleys are converted into paddyfields. Poison is used in the Mahanadi gorge inside the sanctuary (since the last two years) to catch fish, which will severely impact the ecology.

According to Wild Orissa, a local NGO, the elephant corridor between Satkosia Gorge Wildlife Sanctuary and Kapilas forest in Dhenkal district has been severed at many places due to canals laid under the Rengali Irrigation Project. Before constructing the canals, the government had promised that the corridors would remain intact, but this promise was not kept, and nearly 100 Asiatic Elephants are isolated in Kapilas forest, unable to access the rich forests and water resources of Satkosia Gorge (Monalisa Bhujabal, *in litt.* 2002).

KEY CONTRIBUTORS

Bivash Pandav, B.C. Choudhury, Biswajit Mohanty, Monalisa Bhujabal.

KEY REFERENCES

- Ali, S. and Ripley, S.D. (1987) *Compact Handbook of the birds of India and Pakistan*. 2nd edn. Oxford University Press, Delhi.
- BirdLife International (undated) *Important Bird Areas (IBAs) in Asia: Project Briefing Book*. BirdLife International, Cambridge, UK. Unpubl.
- Choudhury, L.N. (undated) *Management Plan of Satkosia Gorge Sanctuary (Orissa): 1978–79 to 1982–83*. Wildlife Institute of India, Dehradun.
- Grimmett, R., Inskipp, C., and Inskipp, T. (1998) *Birds of the Indian Subcontinent*. Christopher Helm, UK.
- Ripley, S.D. (1978) Changes in the bird fauna of a forest area, Simlipal Hills, Mayurbhanj District, and Dhenkal District, Orissa. *JBNHS* 75: 570–574.
- Singh, D.K. (2010) Sighting of Thick-billed Green-pigeon *Treron curvirostra* in Satkosia Tiger Reserve, Orissa, India. *Indian BIRDS* 6(3): 84.

Links:

<http://www.sanctuaryasia.com/conservation/news/1432-satkosia-declared-a-tiger-reserve.html>

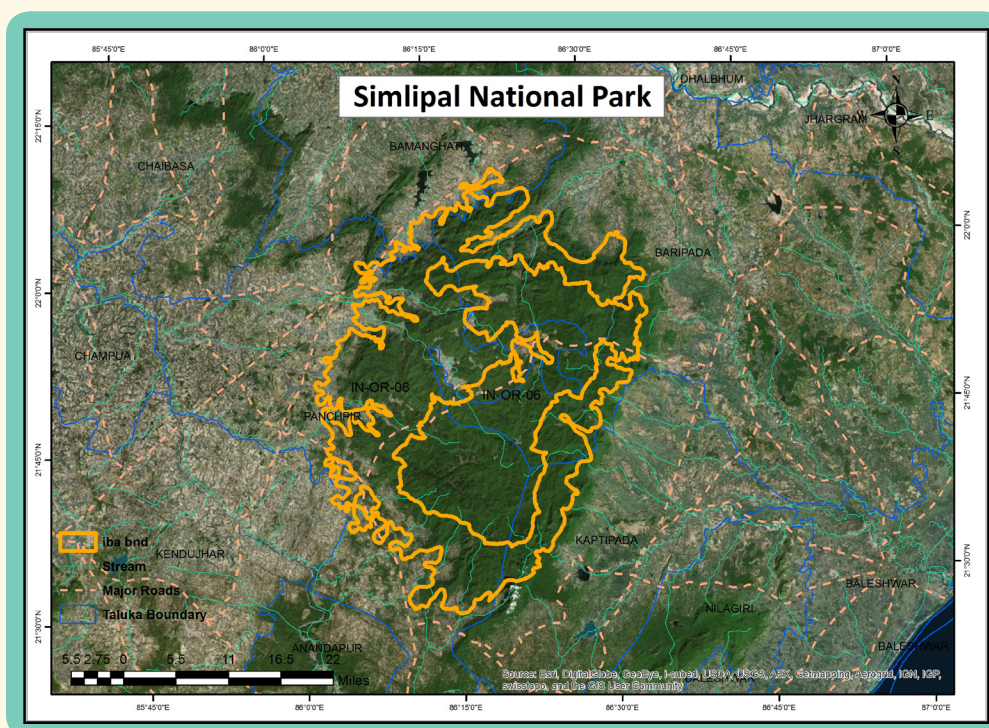
SIMLIPAL NATIONAL PARK AND TIGER RESERVE

IN-OR-06

IBA Site Code	: IN-OR-06	Altitude	: 500–1,200 msl
State	: Odisha	Rainfall	: 2,000 mm
District	: Mayurbhanj	Temperature	: 5 °C to 45 °C
Coordinates	: 21° 55' 52" N, 85° 59' 40" E	Biogeographic Zone	: Deccan Peninsula
Ownership	: State	Habitats	: Tropical Semi-evergreen Forest, Tropical Moist Deciduous Forest, Tropical Dry Deciduous Forest
Area	: 84,570 ha		

IBA CRITERIA: A1 (Threatened species), A3 (Biome 10: Indian Peninsula Tropical Moist Forest, Biome 11: Indo-Malayan Tropical Dry Zone)

PROTECTION STATUS: Simlipal as part of the UNESCO World Network of Biosphere Reserve since 2009. NP in 1980 and Tiger reserve in 1956 as per wikipedia



GENERAL DESCRIPTION

Simlipal National Park is the most important protected area of Orissa, and one of the largest tiger reserves (275,000 ha) in India. At one time, it was the hunting ground of the Maharajas of Mayurbhanj, where record-sized tigers were shot. In 1980, an area of 84,570 ha was declared as Simlipal National Park, but the core area continues to have four villages which have not been shifted even after 30 years. The surrounding forest was designated as the buffer zone, where tribals continue to live their traditional life. A much larger area of 437,400 ha constitutes Simlipal Biosphere Reserve (Srivastava & Singh 1988).

The highest peak in Simlipal Hills is Khairi-buru (1,178 m). There is no scarcity of water at any time of the year in

the Simlipal Hills. Several streams flow through the national park and drain ultimately into the Bay of Bengal. The major perennial streams are the Budhabalanga, Palpala, Deo, Nekendanacha, Bandan, Kahairi, and Khadkei.

Simlipal is very popular with tourists who come to enjoy its scenic beauty and to see the Tiger, but most of them remain unaware of the rich birdlife of this area.

The vegetation of Simlipal NP ranges from Semi-evergreen to Dry Deciduous. Semi-evergreen forest is characterized by *Michelia champaca*, *Anthocephalus cadamba*, and *Mesua ferrea*. Moist Deciduous Forest harbours *Shorea robusta*, *Terminalia arjuna*, and *T. chebula*, and Dry Deciduous Forest has *Boswellia serrata* and *Acacia leucophloea*. The most important species are *Shorea robusta*, *Terminalia*



DRITIMAN MUKHERJEE

Simlipal is one of the largest Tiger Reserves of India and also one of the finest large tract of Semi-evergreen, Moist Deciduous and Dry Deciduous forests. This PA/IBA is a good representative of Biome 11 (Indo-Malayan Tropical Dry Zone) and has 34 out of 59 species listed by BirdLife International for this Biome

tomentosa, *Syzygium cumini*, *Protium serratum*, and *Dillenia pentagyna* (Mohanty *et al.* 2002). More than 90 species of orchids are found in this IBA, of which at least two, *Eria meghasaniensis* and *Bulbophyllum panigrahium*, are endemics.

AVIFAUNA

Despite the great importance of Simlipal NP to the Orissa government and Project Tiger authorities, its birdlife is not well documented. However, Jain (2001) says that more than 250 species of birds are found here. Simlipal forest stands as a link between the flora and fauna of southern India and the Himalaya. For instance, the Red-breasted Falconet *Microhierax caerulescens* was sighted in Simlipal in 1987 (Prakash & Rahmani 1989), far south of its known range in the Himalayan foothills, Sikkim, Bhutan, and Assam (Ali & Ripley 1987).

During 2012 and 2013, observations were made on the Purple or Pale-capped Wood-pigeon *Columba punicea*, a globally Threatened species, in the Simlipal forest area. Members of Wild Orissa, an NGO, observed two individuals in Simlipal Tiger Reserve during April, 2014 (Monalisa Bhujabal, *pers. comm.* 2014). Bird photographers also recorded this species in the outlying areas of Bhubaneswar in 2013.

BirdLife International (undated) has identified 59 species in Biome 11 (Indo-Malayan Tropical Dry Zone, of which 34 have been reported from Simlipal. Besides, five species of Biome 10 (Indian Peninsula Tropical Moist Forest) are also seen. Species at the northernmost extreme of their range in Simlipal are the Malabar Trogon *Harpactes fasciatus*, Malabar Pied Hornbill *Anthracoceros coronatus*, and Malabar Whistling Thrush *Myophonus horsfieldii*. Essentially Himalayan species, such as Blue-faced Malkoha *Phaenicophaeus tristis* and Blue-throated Barbet *Megalaima asiatica*, are near their southern limit in Simlipal (Kazmierczak & Singh 1998). Ripley (1978) recorded *Picus canus*, another Himalayan bird with disjunct distribution in Mayurbhanj district in Orissa (see map 6, plate 16, Grimmett *et al.* 1999). Other Himalayan species found in these forests are Rufous-capped Babbler *Stachyris ruficeps* and Pin-striped Tit-Babbler *Macronous gularis* (Ripley 1978). Thick-billed Green-pigeon *Treron curvirostra* is an addition to the Himalayan species found in this IBA. Nair (2010) sighted a flock of six birds at Badamakabadi in Pithabata. Further records include a single bird from Jenabil village in March 2007, six birds from Upper Barakamura in March, 2007, a flock of 20 birds from Bhanjabasa in November, 2007, a pair from Nekedanocha in January, 2008, and one pair from Gurguria in May, 2008. One more Himalayan species recently found in this IBA is

Pale-footed Bush-warbler *Urosphena pallidipes*, sighted by Karuthedathu *et al.* (2014) in the Sal forests of Simlipal Tiger Reserve. The only published record of this species from peninsular India is of a specimen from Sankrametta from northern Eastern Ghats, Andhra Pradesh.

CRITICALLY ENDANGERED

White-rumped Vulture	<i>Gyps bengalensis</i>
Long-billed Vulture	<i>Gyps indicus</i>
Red-headed Vulture	<i>Aegypius calvus</i>

VULNERABLE

Greater Spotted Eagle	<i>Clanga clanga</i>
Purple Wood-pigeon	<i>Columba punicea</i>
Green Munia or Green Avadavat	<i>Amandava formosa</i>

NEAR THREATENED

Red-headed Falcon	<i>Falco chicquera</i>
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BIOME 10: INDIAN PENINSULA TROPICAL MOIST FOREST

Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>
Malabar Trogon	<i>Harpactes fasciatus</i>
Malabar Pied Hornbill	<i>Anthracoceros coronatus</i>
Indian Scimitar-babbler	<i>Pomatorhinus horsfieldii</i>
Malabar Whistling-thrush	<i>Myophonus horsfieldii</i>

BIOME 11: INDO-MALAYAN TROPICAL DRY ZONE

Loten's Sunbird	<i>Nectarinia lotenia</i>
Red-headed Vulture	<i>Aegypius calvus</i>
White-eyed Buzzard	<i>Butastur teesa</i>
Red-headed Falcon	<i>Falco chicquera</i>
Rain Quail	<i>Coturnix coromandelica</i>
Jungle Bush-quail	<i>Perdica asiatica</i>
Painted Bush-quail	<i>Perdica erythrorhyncha</i>
Painted Spurfowl	<i>Galloperdix lunulata</i>
Indian Peafowl	<i>Pavo cristatus</i>
Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>
Yellow-footed Green-pigeon	<i>Treron phoenicoptera</i>
Plum-headed Parakeet	<i>Psittacula cyanocephala</i>
Sirkeer Malkoha	<i>Phaenicophaeus leschenaultii</i>
Common Indian Nightjar	<i>Caprimulgus asiaticus</i>
Indian Grey Hornbill	<i>Ocyrceros birostris</i>
Brown-headed Barbet	<i>Megalaima zeylanica</i>
Lineated Barbet	<i>Megalaima lineata</i>
Yellow-fronted Pied Woodpecker	<i>Dendrocopos mahrattensis</i>
Black-rumped Flameback	<i>Dinopium benghalense</i>
Red-winged Bushlark	<i>Mirafra erythroptera</i>
Bengal Bushlark	<i>Mirafra assamica</i>
Ashy-crowned Sparrowlark	<i>Eremopterix grisea</i>
Black-headed Cuckooshrike	<i>Coracina melanoptera</i>
Small Minivet	<i>Pericrocotus cinnamomeus</i>
Common Woodshrike	<i>Tephrodornis pondicerianus</i>
White-browed Bulbul	<i>Pycnonotus luteolus</i>
Indian Robin	<i>Saxicoloides fulicata</i>
Rufous-bellied Babbler	<i>Dumetia hyperythra</i>
Jungle Babbler	<i>Turdoides striatus</i>
Ashy Prinia	<i>Prinia socialis</i>
Grey-headed Starling	<i>Sturnus malabaricus</i>
Brahminy Starling	<i>Sturnus pagodarum</i>
Bank Myna	<i>Acridotheres ginginianus</i>
White-bellied Drongo	<i>Dicrurus caerulescens</i>

Thus, Simlipal is a very interesting IBA, not only from the view point of protection of tropical dry forest avifauna, but also from the biogeographic point of view, as it connects eastern Himalayan avifauna to that of the Western Ghats, albeit through a weak link.

OTHER KEY FAUNA

The important mammals of Simlipal NP include Tiger *Panthera tigris*, Leopard *Panthera pardus*, Asiatic Elephant *Elephas maximus*, Sambar *Rusa unicolor*, Mouse Deer *Moschiola indica*, Chital *Axis axis*, Gaur *Bos gaurus*, Wild Dog *Cuon alpinus*, Sloth Bear *Melursus ursinus*, and Striped Hyaena *Hyaena hyaena*. Among reptiles, Mugger *Crocodylus palustris* is the most prominent species. King Cobra *Ophiophagus hannah* is also found.

LAND USE

- Tourism and recreation
- Nature conservation and research

THREATS AND CONSERVATION ISSUES

- Poaching
- Overgrazing on the fringes and around villages

Despite the best efforts of the Odisha Forest Department, poaching of wild animals and birds continues to this day, particularly in the buffer zone and areas adjoining the core/critical tiger habitats. The birds trapped are mainly Oriental Pied Hornbill *Anthracoceros albirostris*, Common Hill Myna *Gracula religiosa*, Plum-headed Parakeet *Psittacula cyanocephala*, and munias. These birds are traded to satisfy the demand from Odisha and adjoining states.

Forest fires every year continue to destroy biodiversity and cause tremendous adverse impacts on the forest cover. One of the major reasons for manmade fires is to increase accessibility for collection of non timber forest products, and this causes a lot of damage to undergrowth.

Insurgency, which was present at subterranean levels, raised its ugly head in the year 2009, when massive damage was inflicted on the protected area infrastructure and manpower, including captive elephants. It took the Forest Department two years to bring back some sense of normalcy. It was during the intervening period, i.e. 2009 to 2011, that the local NGO, Wild Orissa, continuously supported the interventions of the enforcement agencies, and a lot of wildlife conservation activities could be organized, including wildlife awareness camps, bird conservation camps, and training for eco-guides on birds and wild animals. A book in Oriya language on the common birds of Orissa (now Odisha) was published by Wild Orissa for the staff and officials of Simlipal Tiger Reserve. Today, some insurgents remain but their activities have been scaled down to a large extent.

Enhanced biotic pressures, by way of increasing human and cattle population, have impacted the areas available for

wildlife. Illegal felling by ingenuous methods like ringing is prevalent in the Simlipal forests. There has been a crackdown on the timber mafia of late, but the problem persists.

During 2014, Wild Orissa organized a day long interaction on bird conservation under the banner of the IBCN, with the inhabitants of some remotely located hamlets in Simlipal. The participants were sensitized on various issues concerning wild bird conservation in Simlipal. Being remotely located amidst dense forests, these traditional dwellers cannot access outreach programmes on specific issues of bird conservation. This occasion was utilized to sensitize children, teachers, women, village elders, and village council representatives. Conservation education material was distributed. This programme was conducted in association with the Simlipal Tiger Reserve authorities.

According to Srivastava & Singh (2002), the major issues affecting Simlipal and requiring management interventions with research data and support are:

- Human-wildlife interface and mitigation of human-wildlife conflict,
- Management of ecotourism,
- Impacts of incompatible developmental programmes launched by other agencies,
- Biodiversity status assessment and monitoring with particular emphasis on invertebrates and lower plants,
- Impacts of habitat alteration,
- Checking large-scale hunting, illegal extraction of timber and collection of non-timber forest products, human encroachment into forested areas, increasing cattle population, forest fires.

The Wildlife Society of Orissa (WSO) has reported that overgrazing is a major problem, as goat rearing is very popular here. There are presently 65 villages inside Simlipal TR, all of which have a population of goats. An estimated 7,000 goats from the villages inside the park and another 70,000 from the peripheral villages of the sanctuary graze inside the park daily. This adversely affects wild herbivores like Sambar, Barking Deer, and Gaur.

Organized poaching of elephants, ritual mass hunting (*Akhand Shikar*) of animals by tribals during April, and poisoning is a major problem. *Akhand Shikar*, or non-stop hunting for seven days occurs in April every year. The Forest Department and NGOs have started a campaign and education programme among the tribals against mass killing, because of which many villagers have now stopped participating in this organized annual ritual.

The tiger population (estimated at 99, according to the 2004 census) is concentrated in the 845 sq. km core

area due to the extensive disturbance of habitat in the 2,200 sq. km buffer area. There is a big question mark on the future of Simlipal's tigers. Black tigers, indicative of genetic aberration, have been sighted by forest officials in recent years. Some experts believe that this is the result of inbreeding, since the population is confined to a small patch and corridors for movement to other forests like Keonjhar and Kuldiha do not exist any more.

Lack of management resources is another major problem in this large forest. The forest authorities have only four vehicles, shared by five rangers! As many as 40 posts are lying vacant (P. Das, *in litt.* 2000). For the last 20 years, the district authorities have not been able to shift four villages from the core area, though the park authorities have deposited funds for this purpose.

KEY CONTRIBUTORS

Wildlife Society of Orissa, Monalisa Bhujabal, Wild Orissa.

KEY REFERENCES

- Ali, S. and Ripley, S.D. (1987). *Compact Handbook of the Birds of India and Pakistan*. Oxford University Press, New Delhi.
- Grimmett, R., Inskipp, C., and Inskipp, T. (1999). *Pocket Guide to the Birds of the Indian Subcontinent*. Oxford University Press, New Delhi.
- Jain, P. (2001) Project Tiger Status Report. Ministry of Environment and Forests, Government of India, New Delhi.
- Karuthedathu, D., Das, V., Praveen, J., Ramachandran, V., Shurpali, S., and Nair, M.V. (2014) Some significant avian records from Odisha. *Indian BIRDS* 9(1): 14–18.
- Kazmierczak, K. and Singh, R. (1998) *A Birdwatchers' Guide to India*. Prion Birdwatchers' Guide Series, Prion Ltd., Sandy, UK.
- Mohanty, R.C., Mishra, R.K. and Bal, S. (2002) Phytosociological and plant diversity studies of Simlipal Biosphere Reserve. Pp. 16–26. In: Proceedings of National Seminar on Conservation of Eastern Ghats, March 24–26, 2002, Tirupati, Andhra Pradesh.
- Prakash, V. and Rahmani, A.R. (1989) Occurrence of Redbreasted Falconet *Microhierax caerulescens* (Linn.) in the Simlipal Tiger Reserve, Orissa. *JBNHS* 86: 241.
- Ripley, S.D. (1978). Changes in the bird fauna of a forest area, Simlipal Hills, Mayurbhanj district, and Dhenkanal district, Orissa. *JBNHS* 75: 570–574.
- Srivastava, S. and Singh, L.A.K. (1988) Simlipal Biosphere Reserve. Pp. 65–70. In: Maikhuri, R.K., Rao, K.S., and Rai, R.K. (Eds) *Biosphere Reserves and Management in India*. Himavikas Occasional Publication No. 12. G.B. Pant Institute of Himalayan Environment and Development, Almora.
- Srivastava, S. and Singh, L.A.K. (2002) Simlipal Biosphere Reserve. Pp. 485–491. In: Ramakrishnan, P.S., Rai, R.K., Kotwal, R.P.S., and Mehndiratta, S. *Traditional Ecological Knowledge for Managing Biosphere Reserves in South and Central Asia*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

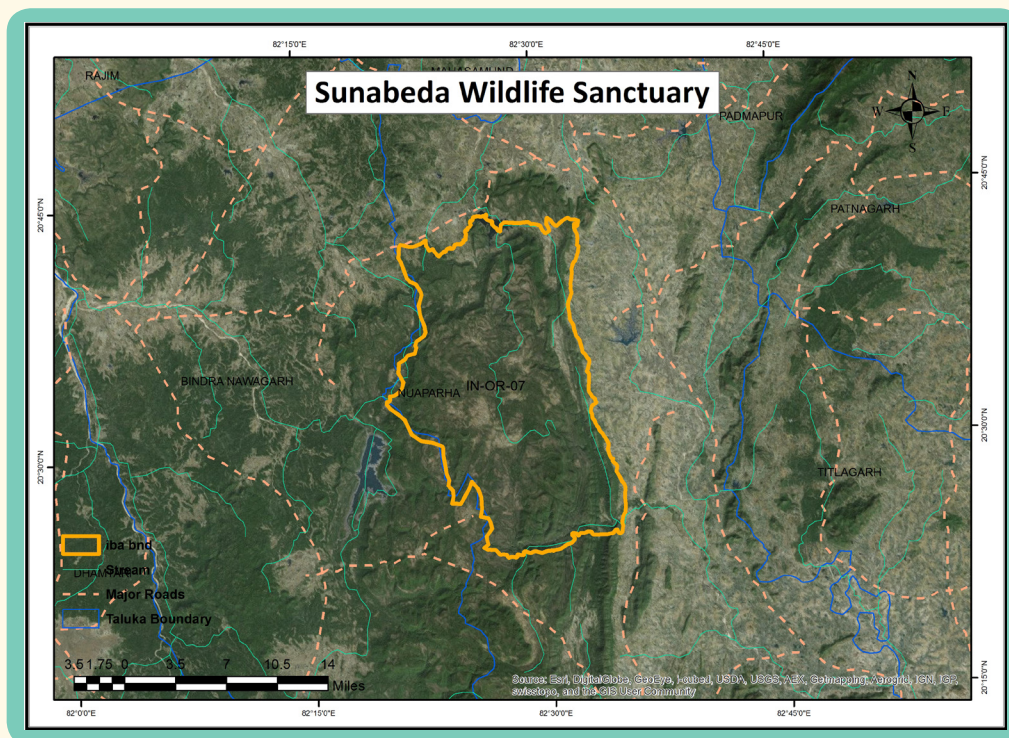
SUNABEDA WILDLIFE SANCTUARY

IN-OR-07

IBA Site Code	: IN-OR-07	Area	: 50,000 ha
State	: Odisha	Altitude	: 350–1,000 msl
District	: Nuapada	Rainfall	: 1,000 mm
Coordinates	: 20° 26' 60" N, 82° 32' 33" E	Temperature	: 8 °C to 47 °C
Ownership	: State	Biogeographic Zone	: Deccan Peninsula
		Habitats	: Tropical Dry Deciduous Forest

IBA CRITERIA: A1 (Threatened species), A3 (Biome 11: Indo-Malayan Tropical Dry Zone)

PROTECTION STATUS: Wildlife Sanctuary, established July, 1988.



GENERAL DESCRIPTION

Sunabeda is situated in the Nuapada district of Odisha, adjoining Chhattisgarh state. The sanctuary harbours a great diversity of wildlife habitats, with a vast plateau and canyons with 11 waterfalls. There are several riparian forest patches where species such as the Giant Squirrel *Ratufa indica* and the Flying Squirrel *Petaurista* sp. could be expected (Kotwal 1997).

The sanctuary forms the catchment area of the Jonk river, over which a dam has been constructed to facilitate irrigation. In Maragura village within the sanctuary, there are 35 families who need to be rehabilitated (Kotwal 1997). The Indra nullah lies to the south and Son river to the west of the sanctuary.

The important vegetation of the site comprises Dry Deciduous Tropical Forest species such as *Tectona grandis*, *Dalbergia sissoo*, *Boswellia serrata*, *Haldina cordifolia*,

Diospyros melanoxylon, *Embllica officinalis*, and *Terminalia bellirica*, as well as Semi-evergreen species around the riverine belt such as *Terminalia arjuna* and *Syzygium cumini*.

AVIFAUNA

At least 200 species of birds have been reported from this area (H.K. Bisht, *in litt.* 2002). BirdLife International (undated) has listed 59 species in Biome 11 (Indo-Malayan Tropical Dry Zone), of which 18 have been seen till now, but more are likely to occur. Except for the two *Gyps* vultures, which are now included in the Critically Endangered category of BirdLife International (2001) due to their steep decline during the last 10 years, none of the other species is threatened with extinction. Biome 11 covers a wide range of habitats, including forests and open country. Many of the species listed have adapted to man-modified habitats. Some species have deviated so far from their earlier distribution

that they may not be useful in identifying IBAs for the protection of this biome (BirdLife International, undated).

OTHER KEY FAUNA

Sunabeda Wildlife Sanctuary has certainly seen better days. It used to harbour Swamp Deer *Rucervus duvauceli branderi* and Wild Buffalo *Bubalus bubalis* (= *arnee*) (Kotwal 1997). Even now, typical central Indian wild mammals such as Tiger *Panthera tigris*, Leopard *P. pardus*, Gaur *Bos gaurus*, Sloth Bear *Melursus ursinus*, Barking Deer *Muntiacus muntjak*, Wild Boar *Sus scrofa*, and Blue Bull *Boselaphus tragocamelus* are found, although depleted by poaching. Among the non-human primates, Common Langur *Semnopithecus entellus* and Rhesus Macaque *Macaca mulatta* are very common. Das (2011) described 62 species of butterflies from this IBA, and also reported three new records to Odisha: Banded Treebrown *Lethe confusa* (Aurivillius), Common Tit *Hypolycaena erylus* (Godart), and Fluffy Tit *Zeltus amasa* (Hewitson).

LAND USE

- Nature conservation and research
- Human settlements

THREATS AND CONSERVATION ISSUES

- Anthropogenic pressure
- Livestock grazing
- Encroachment of forest land
- Forest fires
- Unsustainable exploitation of forest resources
- Illegal felling
- Insurgency
- Poaching
- Undue delay in notification of Tiger Reserve
- Large-scale illegal Cannabis cultivation

According to Kotwal (1997), the Endangered Wild Buffalo used to occur here nearly 70 years ago. At present, it is found in Udanti Wildlife Sanctuary in Chhattisgarh, c. 20 km away, but there is a possible link via Patdhara Reserve Forest corridor. Efforts should be made to improve the habitat so that the Wild Buffalo can come back to Sunabeda using this corridor. This would give a boost to the protection of this sanctuary, which is important for birds also. Sunabeda-Kharia-Udanti is an ideal migration corridor for the Wild Buffalo of central India, so there is tremendous scope to initiate landscape level conservation.

Sunabeda continues to be afflicted with left wing extremism of serious proportions, which renders wildlife conservation and enforcement activities virtually nullified. Cultivation of Ganja *Cannabis sativa* has been a very worrisome development, as it is being practiced in grasslands and higher reaches, creating a major source of illegal income.

CRITICALLY ENDANGERED

White-rumped Vulture	<i>Gyps bengalensis</i>
Long-billed Vulture	<i>Gyps indicus</i>

BIOME 11: INDO-MALAYAN TROPICAL DRY ZONE

Sirkeer Malkoha	<i>Phaenicophaeus leschenaultii</i>
Jungle Bush-quail	<i>Perdica asiatica</i>
Painted Bush-quail	<i>Perdica erythrorhyncha</i>
Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>
Dusky Eagle-owl	<i>Bubo coromandus</i>
Common Indian Nightjar	<i>Caprimulgus asiaticus</i>
Indian Grey Hornbill	<i>Ocyrceros birostris</i>
Brown-headed Barbet	<i>Megalaima zeylanica</i>
Yellow-fronted Pied Woodpecker	<i>Dendrocopos mahrattensis</i>
Black-rumped Flameback	<i>Dinopium benghalense</i>
Red-winged Bushlark	<i>Mirafraga erythroptera</i>
Bengal Bushlark	<i>Mirafraga assamica</i>
White-browed Bulbul	<i>Pycnonotus luteolus</i>
Jungle Babbler	<i>Turdoides striatus</i>
Brahminy Starling	<i>Sturnus pagodarum</i>
White-bellied Drongo	<i>Dicrurus caerulescens</i>

The area was approved in principle (during 2010) for being notified as a Tiger Reserve, but there is an inordinate delay inspite of a number of interventions sought from some quarters, including the NGO Wild Orissa. Unless immediate measures are taken to notify this area, there will certainly be demands for possible diversion of forest land in the coming years. Despite law and order problems, waterfowl count has been undertaken by Wild Orissa in Patora Dam and other smaller waterbodies.

About 64 villages, with a human population of 20,000, fragment this sanctuary and there is a large population of cattle. The villagers subsist on forest products to a great extent, as their land holdings give poor yield. Graziers from other states including Rajasthan arrive here with their camels and goats, which compete with local herbivores for the grass. Though there is a proposal for a tiger reserve, there are extensive encroachments inside the sanctuary. It is doubtful if these people could be shifted (Biswajit Mohanty, *pers. comm.* 2004). The core area of Sunabeda could be increased southwards across the Indra nullah, to add 30,000 ha of forest free of human habitation (Kotwal 1997).

KEY CONTRIBUTORS

P.C. Kotwal, Biswajit Mohanty, Monalisa Bhujabal, Wild Orissa.

KEY REFERENCES

- BirdLife International (2001) *Threatened Birds of Asia: the BirdLife International Red Data Book*. BirdLife International, Cambridge, UK.
- BirdLife International (undated) *Important Bird Areas (IBAs) in Asia: Project Briefing Book*. BirdLife International, Cambridge, UK. Unpubl.
- Das, S.K. and Sahu, H.K. (2011) Preliminary study on butterflies of Sunabeda wildlife sanctuary: A checklist with three new records for Orissa, India. *Indian Forester* 137(10): 1204–1206.
- Kotwal, P.C. (1997) Sunabeda Wildlife Sanctuary: A potential haven for the Cheetah. *Hornbill* 3: 24–27.

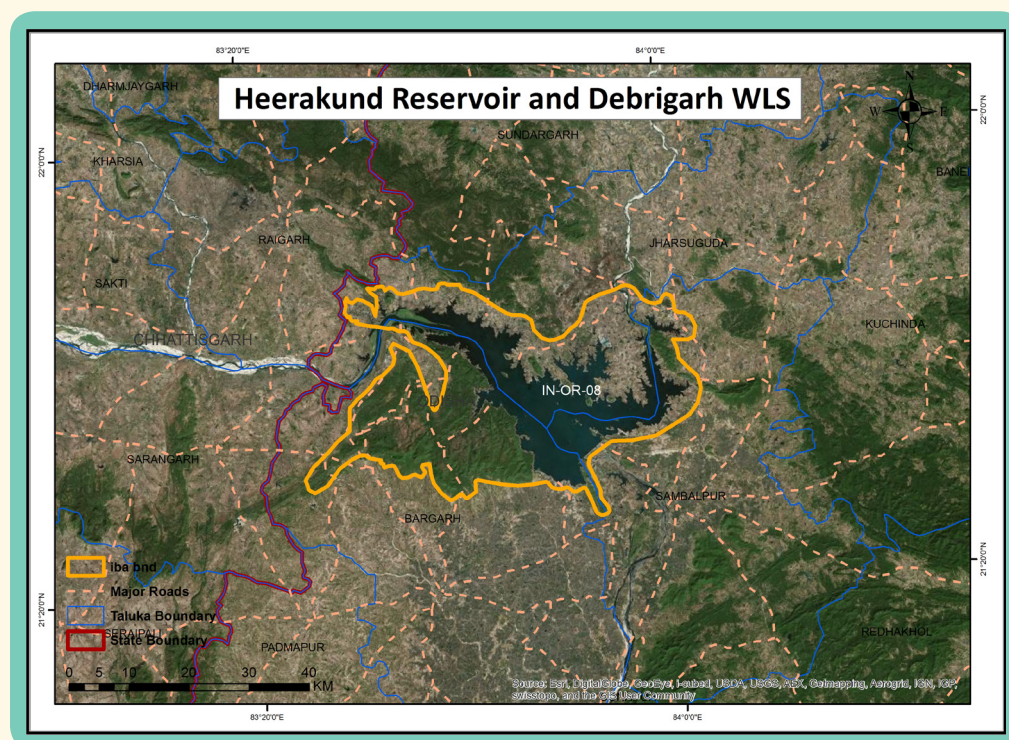
HEERAKUND RESERVOIR AND DEBRIGARH WLS

IN-OR-08

IBA Site Code	: IN-OR-08	Area	: 746 sq. km (man-made reservoir)
State	: Odisha	Altitude	: c.180 msl
District	: Bargarh, Jharsuguda, Sambalpur	Rainfall	: c. 1,500 mm
Coordinates	: 21° 30' to 21° 50' N, 83° 30' to 84° 05' E	Temperature	: 5 °C to 45 °C
Ownership	: State	Biogeographic Zone	: Deccan Peninsula
		Habitats	: Freshwater reservoir

IBA CRITERIA: A1 (Threatened species), A4iii ($\geq 20,000$ waterbirds)

PROTECTION STATUS: Not officially protected. Reservoir included in Hirakud Wildlife Range of Hirakud WL Division.



GENERAL DESCRIPTION

One of the largest man-made waterbodies in Asia, the 746 sq. km Hirakud Reservoir was commissioned in 1957. It has a shoreline of more than 640 km (www.ordistricts.nic.in/district_profile). The 1,248 m long masonry dam has a height of 61 m and this, along with the earthen dams, has a combined length of 25.8 km. Besides having an installed capacity of 347.5 MW, the reservoir serves the irrigation needs of 75,000 sq. km of land (http://en.wikipedia.org/wiki/Hirakud_Dam). The reservoir is fringed to the north and west by the forests of the Debrigarh Sanctuary in Bargarh district, on the eastern side by fishing villages, cultivation, and industrial areas of Jharsuguda district, and on the south-eastern side by forested ridges and inhabited areas of Sambalpur district. About 120 sq. km of the reservoir is under the jurisdiction of Hirakud Wildlife Range for intensive management of avifauna (Nair *et al.* 2014).

During the construction of the dam, an entire valley, with adjoining ridges and plateaus, was submerged. Thus, the reservoir depth varies from place to place. The water regime of the reservoir can be compartmentalized into three zones. The shallow upper zone (18,621 ha) retains some lotic characteristics, while the lower zone next to the dam (40,338 ha) is lacustrine in nature. The middle zone (13,004 ha) is largely a deep waterbody (Nair *et al.* 2014).

The reservoir experiences a steep decline in water level during April to June. Based on satellite pictures, the reservoir area is estimated at 46,381 ha during pre-monsoon and 55,243 ha during post-monsoon seasons. Alternate drying and wetting of the margins helps mineralization and adds to the nutrient content of the water. The mean depth of the reservoir is 11.3 m (Yadava & Sugunan 1992).

According to studies conducted by Nair *et al.* (2014), the marshy Jarimuli island which remains submerged

during high floods and exposed during the summer, along with its surrounding shallow water area, attracts large congregations of waterfowl to its marshes and reed beds. By the peak of summer in mid May-June, the water level reaches a minimum, c. 180 m along the reservoir fringes. During this time, the exposed shoreline, wherever soil cover is present, gets a dense growth of *Cynodon dactylon*, which is excellent forage for wild herbivores, leaving behind reed-filled ponds wherever low-lying depressions occur, providing excellent habitats for a variety of waterfowl.

AVIFAUNA

Based on the studies conducted during a five-year period by Nair *et al.* (2014), a total of 112 species of waterfowl and water-dependent bird species were recorded, including 15 threatened species. The highest number of birds (79,344) was recorded during 2013, with an average yearly count of 63 species and 47,348 individuals.

During studies from 2010 to 2014, a total of 319 bird species were recorded from the Hirakud landscape, which also includes the Debrigarh Sanctuary adjoining the reservoir (Nair, *in prep.*). Of these, 112 species were either waterfowl or birds closely associated with wetlands.

Four heronries protected by villagers were also located (Nair *et al.* 2014). Birds such as Large Egret *Casmerodius albus*, Intermediate Egret *Mesophoyx intermedia*, Little Egret *Egretta garzetta*, Cattle Egret *Bubulcus ibis*, Indian Pond-heron *Ardeola grayii*, Black-rumped Night-heron *Nycticorax nycticorax* and Little Cormorant *Microcarbo niger* were found nesting. The largest among them, a traditional mixed heronry dominated by Asian Openbill *Anastomus oscitans*, had c. 1,200 nests of seven species. Interestingly, two small single-species colonies of Black-headed Ibis *Threskiornis melanocephalus* (Near Threatened), having six and 13 nests each, were also discovered.

Colonies of ground-nesting birds also exist, eight of which have been located here. Breeding of six species of waterbirds, namely i. Black-winged Stilt *Himantopus himantopus*, ii. Oriental Pratincole *Glareola maldivarum*, iii. Small Pratincole *Glareola lactea*, iv. Little Ringed Plover *Charadrius dubius*, v. Little Tern *Sterna albifrons*, and vi. Red-wattled Lapwing *Vanellus indicus* have been recorded, either in single species or multi-species congregations. Such colonies of ground-nesting birds form the second such instance from Odisha, the first being Nalaban Sanctuary in Chilika Lake (Nair *et al.* 2014).

Black-bellied Tern *Sterna acuticauda* (Endangered) and Indian Skimmer *Rynchops albicollis* (Vulnerable) are occasional visitors from the Mahanadi river which flows downstream of the dam. While Black-bellied Tern was seen foraging in both Chaurasimal Creek and Right Dyke shores, just a couple of records exist for Indian Skimmer, near the Main Dam site (Nair *et al.* 2014).

River Lapwing *Vanellus duvaucelii* too ascends to the river from the lower stretches to make rare visits to the dam fringes during summer, especially near the camp site of the Fisheries Department, but is not regularly seen. Lesser Adjutant *Leptoptilos javanicus* is probably a very rare visitor, as only two records have been obtained. Painted Stork *Mycteria leucocephala* and Spot-billed Pelican *Pelecanus philippensis* are occasionally met with during winter in the Jarimuli Island area in the shallow creeks. Eurasian Curlew *Numenius arquata* and Black-tailed Godwit *Limosa limosa* have been seen foraging on the mudbanks and adjoining marshes. Oriental Darter *Anhinga melanogaster* and Black-headed Ibis *Threskiornis melanocephalus* are residents seen regularly, the population of the latter increasing during the summer as it congregates along the receding shores, especially along the Right Dyke.

Occasional presence of three raptor species, namely Pallas's Fish-eagle *Haliaeetus leucorhynchus* along with Greater Clanga *Clanga clanga* and Indian Spotted Eagles *Clanga hastata*, possibly indicates a healthy prey base and an intact food chain.

OTHER KEY FAUNA

The reservoir has a population of Mugger *Crocodylus palustris*, while the forests of the adjoining Debrigarh Sanctuary have rich mammalian fauna, including excellent populations of Indian Gaur *Bos gaurus*, Sambar *Rusa unicolor*, Leopard *Panthera pardus*, and rare species such as Chowsingha *Tetracerus quadricornis*, Rusty-spotted Cat *Felis rubiginosa*, and Indian Pangolin *Manis crassicaudata*.

LAND USE

- Irrigation
- Power generation
- Fisheries
- Recreation

ENDANGERED	
Black-bellied Tern	<i>Sterna acuticauda</i>
VULNERABLE	
Lesser Adjutant	<i>Leptoptilos javanicus</i>
Indian Skimmer	<i>Rynchops albicollis</i>
Pallas's Fish-eagle	<i>Haliaeetus leucorhynchus</i>
Greater Spotted Eagle	<i>Clanga clanga</i>
Indian Spotted Eagle	<i>Clanga hastata</i>
NEAR THREATENED	
Spot-billed Pelican	<i>Pelecanus philippensis</i>
Oriental Darter	<i>Anhinga melanogaster</i>
Painted Stork	<i>Mycteria leucocephala</i>
Black-headed Ibis	<i>Threskiornis melanocephalus</i>
Ferruginous Duck	<i>Aythya nyroca</i>
Black-tailed Godwit	<i>Limosa limosa</i>
Eurasian Curlew	<i>Numenius arquata</i>
River Lapwing	<i>Vanellus duvaucelii</i>

THREAT AND CONSERVATION ISSUES

Hirakud has been included in the List of Prioritized Inland Wetlands of Odisha (Prasad *et al.* 2004). About 120 sq. km of the reservoir is under the management of Hirakud Wildlife Division of the Forest Department. Further, the Jarimuli upland area (c. 27 ha of the upland with its marshlands, reed beds, and mud banks, together with the surrounding shallow water region, totalling c. 5 sq. km) provides rich foraging and resting grounds for wintering waterfowl, as well as nesting for resident birds. The Forest Department should initiate actions to declare the area as a Bird Sanctuary/Community Reserve.

There is serious concern about the discharge of alkaline effluents into the reservoir from three paper mills, and rapid industrialization on the northern side (Nair *et al.* 2014). Though the fishing rights of Hirakud are regulated by the State Fisheries Department through five sectors being leased out to cooperative societies, an increase in the use of zero mesh size fishing nets poses a grave threat to juvenile fishes. The existing ban on fishing during the fish-breeding season in July and August by the Fisheries Department, though an admirable policy, suffers from lack of strict implementation.

Poaching and trapping of birds, though reportedly rampant a decade ago, has come down substantially, especially in the western, southern, and south-eastern sectors, thanks to enforcement by the local Forest Departments. However, the northern and north-eastern sectors still pose a problem. A very unique method of trapping birds, using huge trap nets, have been noticed in the Govindpur Island area, which requires constant attention from the Forest Department.

Another pernicious threat is the collection of eggs of ground-nesting waterbirds by local fishermen from the shores and uninhabited islands. This practice, highly prevalent over the area, is gradually on the wane, following concerted awareness campaigns.

Nair *et al.* (2014) have suggested the following measures for the protection of biodiversity of Hirakud Reservoir and surrounding areas:

1. Strengthen and institutionalize the existing system of unified waterfowl census involving four forest divisions by capacity building of staff and interested civil society members.
2. Initiate regular monitoring programmes and long-term research projects in Hirakud along the lines of what is being done in Chilika.

3. Integrate Citizen Science initiatives to mobilize qualified manpower for regular census, monitoring, and capacity building of staff.
4. Sensitize departmental staff regarding waterfowl conservation and step up vigilance in vulnerable pockets to prevent poaching, and in case of actionable intelligence to immediately conduct search, seizures, arrests, and subsequent prosecutions.
5. Survey all the islands and potential shorelines along the reservoir for colonies of nesting birds.
6. Survey the fringe villages for traditional heronries or roosting sites and nests of water-dependent raptors.
7. Initiate awareness programmes for local residents regarding the importance of wetland and waterfowl conservation, with special targeted attention on campaigns for local fishermen, to prevent poaching and egg collection.
8. Set the grounds and convince all stakeholders for the establishment of a Bird Sanctuary/Community Reserve in the Jarimuli upland and surrounding 5 sq. km shallow water area.
9. Leverage the enormous ecotourism potential of the site by promoting birdwatching as an activity, involving local people as Bird Guides, encouraging home stays. The expertise already available with the Forest Department in running successful participatory ecotourism at Barakhandia ecotourism complex in Debrigarh Sanctuary can be the model for this.

KEY CONTRIBUTOR

Manoj Nair

KEY REFERENCES

- Nair, M.V., Panda, S.K., and Pradhan, A.K. (2014) Hirakud Wetlands: A little-known refuge for breeding and wintering waterfowl and a potential Important Bird Area in Odisha, India. In: Gopi, G.V. and Hussain, S.A. (Eds) *Waterbirds of India*. ENVIS Bulletin: Wildlife and Protected Areas. Wildlife Institute of India, Dehradun. Vol. 16, Pp. 186–201.
- Prasad, S.N., Jaggi, A.K., Tiwari, A.K., Kaushik, P., Vijayan, L., Muralidharan, S., and Vijayan, V.S. (2004) *Inland Wetlands of India – Conservation Atlas*. Sálim Ali Centre for Ornithology and Natural History, Coimbatore, India.
- Yadava, Y.S. and Sugunan, V.V. (1992). Hirakud reservoir - Strategies for fisheries development. *Bulletin* 66. Central Inland Capture Fisheries Research Institute, Barrackpore, India. Pp. 18.